1-1-1960

Animistic responses as influenced by experimentally strengthened associative chains and set-inducing instructions.

Alvin J. Simmons
University of Massachusetts Amherst

ANIMISTIC RESPONSES AS INFLUENCED BY EXPERIMENTALLY STRENGTHENED ASSOCIATIVE CHAINS AND SET-INDUCING INSTRUCTIONS

SIMMONS - 1960

ANIMISTIC RESPONSES AS INFLUENCED BY EXPERIMENTALLY STRENGTHENED ASSOCIATIVE CHAINS AND SET-INDUCING INSTRUCTIONS

Alvin J. Simmons

B.A., Boston College, 1952

M.S., University of Massachusetts, 1954

Thesis Submitted in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy

University of Massachusetts, Amherst

1960

Table of Contents

Table of Contents (continued)

Introduction

Simmons and Goss' (1957) finding that instructions to respond "like a poet" produced marked increases in frequencies of animistic concepts was the first step in a long-term program of research aimed at experimental isolation of the more important determinants of animistic thinking. The present study - the second step of this program - was concerned with (a) replication of the apparent effect of an increase in the frequency of animistic responses under poet instructions, and (b) a more direct test of the mediated-generalization account of the conditions of occurrence of such responses proposed by Simmons and Goss. Before more specific consideration of these objectives, however, pertinent results of largely descriptive and comparative studies of animistic thinking will be summarized.

Descriptive and comparative studies

An historical survey of casual anecdotal or reflective descriptions of animistic thinking can be found in Dennis (1938). Systematic observation of the occurrence and chronological changes of animistic thinking began with Piaget (1926, 1928, 1929, 1930, 1933) who characterized such thinking as the tendency to regard objects, which are inanimate by scientific criteria, as living and endowed with will. Subsequent investigators have adhered closely to this definition of animism (Johnson, 1955; Vinacke, 1952).

Piaget's protocols, obtained by what he termed "the

clinical method," consisted of children's spontaneous speech and conversation in "natural" social situations and of their reactions in interview and test situations. These protocols were interpreted as indicating that evolution of animistic concepts occurred in four relatively distinct developmental stages; namely (a) the belief that everything active in any way, even if stationary, is conscious (alive), (b) attribution of consciousness or life to objects or things that can move, and to them only, (c) considering only objects which move of their own accord, independent of an outside agent, as conscious or alive, and by ages 10 or 12 (d), the beginning of awareness of making the rational distinction that consciousness is an attribute of the animal world alone. Piaget further hypothesized that animistic thinking is a manifestation of a genetically determined mode of thinking which is characterized by lack of differentiation between the physical and the psychic and by "sentimental reactions due to egocentricity and to the constant introjection which this egocentricity implies" (Piaget, 1933, p. 539).

Table 1 summarizes the more important features - the purpose, data-gathering techniques, Ss, results, and interpretive conclusions - of a number of investigations of various aspects of Piaget's methods and findings. Hazlitt (1930), Johnson and Josey (1931-32), Abel (1932), Deutsche (1937), and Oakes (1947) were primarily concerned with the validity of Piaget's general hypotheses of the evolution of

Table 1

Summary of Main Features of Descriptive and Comparative Studies of Animistic Thinking

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Hazlitt (1930)	Test Piaget's two assumptions: 1. Thinking identified with ability for verbal expression. 2. Matter of thought is indifferent to the process.	Individual testing.	88 Ss from 3-7 years of age.	1. Children managed to make an exception. 2. Recognition of a common element is possible for very young children.	1. No age limit in relation to process of thinking beyond that imposed by lack of experience. 2. Lack of experience due to inability to see relations which is attributed to egocentrism.
Johnson & Josey (1931-32)	Replicate Piaget's studies on child's language, thought, judgment, reasoning, and conception of world.	Piaget's clinical method.	55 children from superior homes and in an excellent school.	Substantiate few of the claims of Piaget.	1. Thinking of child of 6 is not characterized by finalism, artificialism, or animism. 2. Children of 6 were socially minded and not egocentric.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Mead (1932)	Test Piaget's findings.	1. Observations in social situations. 2. Spontaneous drawings. 3. Interpretations of ink blots. 4. Definite questions to provoke animistic responses.	22 Ss between 2 & 6 years and 19 Ss between 6 & 12 years.	1. Animism virtually negative for all four methods. 2. Manus children show negatism towards animistic explanations. 3. Manus child is less animistic than Manus adult.	1. Animism is: (a) culturally determined. (b) potentiality of human mentality under special cultural conditions. (c) not inevitable concomitant of any stage of mental development. (d) not explained in terms of intellectual immaturity.
Abel (1932)	Test hypothesis: syncretism and juxtaposition are a function of the nature, difficulty, and complexity of the material.	Two selections of 186 words presented to Ss. Each selection contained 13 essential items to be remembered and understood.	42 freshmen and sophomore college girls from 17 to 21 years. Two groups made equivalent on scores made on I.Q. test.	1. Hypothesis confirmed.	1. Adults do not understand each other relatively better nor import relatively more information than do children. 2. Juxtaposition and syncretism vary inversely with increase of age in children and directly with complexity of stimuli in adults.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Deutsche (1937)	Classify responses according to Piaget's 17 types.	Group test with and without demonstration.	Individual questioning: 1. 732 Ss between 8-16 years in grades 3-8. 2. 13 Ss between 59-70 mos.	1. Animistic types negligible. 2. Naturalism increases and anthropomorphism and phenomenalism decrease with age. 3. Classification found difficult.	Types of explanations vary more from question to question than from age to age.
Russell & Dennis (1939)	Develop a standardized questioning procedure for investigating children's animistic notions.	Individual questioning using list of 20 objects 8 of which were actually present.	385 Ss from 3 to 15 1/2 years from lower middle class, English speaking homes.	87% of responses were classified according to Piaget's four stages of animism.	Permits an objective study of factors associated with animism.
Russell (1940)	Investigate animistic notions of children.	Individual questioning with 20 objects.	774 children in primary grades of different geographical locations and socio-economic status and groups of different median I.Q.'s. CA ranges from 6 to 15 1/2 years.	1. 98.5% of cases readily classified according to Piaget's four stages of animism. 2. Each stage shows a regular and characteristic orderly progression independent of sex, geographical and socio-economic differences, nationality, mental ability, and special nature training.	Revealed the impossibility of limiting the age range of the stages as Piaget had attempted.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Russell, Dennis, & Ash (1940)	Find influence of additional years of experience on animism when MA is held constant.	Individual questioning with standardized series of 20 objects.	430 feebleminded Ss: 1. MA's ranged from 2 yrs. 11 mos. to 11 yrs. 7 mos. 2. CA's ranged from 7 yrs. 2 mos. to 64 yrs.	1. 98.5% of responses were classifiable into Piaget's four stages of animism. 2. Holding MA constant: (a) feebleminded Ss more advanced than normal. (b) older feebleminded Ss more advanced than younger feebleminded.	Age is a variable which affects development of ideas when MA is held constant.
Russell (1940)	Investigation of concepts allied to animism (i.e. feeling and knowing).	Standardized procedure of individual questioning with 20 objects.	335 children in grades 1-7 ranging in I.Q. from 52-131 with median I.Q. of 94.08.	1. 99% of subjects classified in Piaget's categories. 2. In progression of stages, allied concepts more advanced above the 6-7 MA and CA levels. This contradicts Piaget. 3. 63% correspondence between the stages of animism and the stages of allied concepts.	Use of the term animism as descriptive of the subject's idea of life.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Dennis & Russell (1940)	Application of Piaget's questions to Zuni children.	Piaget's method of questioning applied to list of 20 standardized objects.	24 Zuni children 8 to 16 years of age.	1. Animistic answers were of the same types and stages as those obtained by Piaget. 2. Zuni children on the whole may persist longer in the first stage of animism than do white American children.	Zuni children like white American and European children over generalize terms for designating life.
Bruce (1941)	Animism vs. evolution of the concept "alive."	Individual questioning until clear concept evolved.	72 White Southern and 62 Negro children.	1. Confirmed Piaget's finding of 4 stages in development of the child's concept of alive. 2. Supported findings of Russell and Dennis that each of the 4 stages occurs at most age levels in both groups.	Function, then movement and finally breathing and growth may be isolated as criteria of the concept "alive."

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Russell (1942)	To study animism in older children.	Standardized list adapted for group testing yielding answers and reasons.	611 Ss with wide divergence of environments. Range in CA from 8-20 and range in grade from 5 to 12.	1. 98% of Ss were classified into one or another of the stages of animism found to exist among younger children. 2. Stages of animism are equally related to both MA and CA. 3. Definite increase in percentage of Ss in adult stage with progressive increases in MA and CA.	Occurrence of animism among adults.
Dennis (1942)	Obtain data from a young child whose home instruction is known to the investigator.	Individual questioning.	One young child whose explanations of natural phenomena given to child consisted of simple, natural science explanations.	1. Typical stage I answers reported by Piaget were obtained at 2 years 9 months. 2. At 6 years 2 months this child gave adult answers to Piaget's questions.	1. Answers are autogenous in origin and are not transmitted by adults. 2. Great variations in the age of disappearance of childish conceptions.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Dennis (1943)	Animism and related tendencies in Hopi children.	Standardized individual interview with regard to animism, moral realism and attribution of consciousness to a list of 20 objects.	98 Hopi children between 12 and 17 yrs. inclusive.	1. Hopi Ss more animistic, expressed more belief in consciousness of objects and in moral realism than do white American Ss of the same ages. 2. Hopi concepts are of the same types as those found among white children. 3. Frequency of attribution of consciousness corroborate widespread animism. 4. White children give up animistic ideas at a faster rate than do the Hopi.	1. Animism is culturally determined. 2. Animistic ideas are autogenous. Society affects the fate of these ideas but not their origin.
Huang & Lee (1945)	Experimental analysis of child animism.	Individual questioning (7 questions about each of 10 objects).	40 children ranging in age from 3 to 11 years inclusive.	1. An inanimate object is said to be alive only in a small proportion of cases. 2. Knowledge about anthropomorphic traits is in general more advanced than judgment regarding animation. 3. "Living" is more loosely applied than is "having life" but difference tends to decrease with age. 4. Older group gave more correct answers than the younger group for all objects.	1. Principle of differentiation accepted as a valid explanation of the genesis of the ideas of life and inanimation. 2. Animistic concepts are to be explained by the apparent characters of the specific object rather than by any general tendency.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Dennis & Mallinger (1949)	Animism and related tendencies in senescence.	Individual questioning.	36 Ss 70 years of age and older all of white race.	1. 75% gave answers which can be considered those of childhood level of development. 2. 53% attributed the ability to know or to feel to certain inanimate objects.	Difference between answers of old people and children arise from greater vocabulary and greater mastery of language in the aged.
Dennis (1953)	Animistic thinking among college and university students.	Group testing by questionnaire.	Four groups: 1. 67 naive Ss. 2. 71 Ss in introductory psychology. 3. 34 Ss in child psychology. 4. 68 Ss had emphasis on distinctive characteristics of living things.	Group 1 - 45%) Group 2 - 37%) Group 3 - 48%) Group 4 - 12%)) Gave one or more animistic answers.	1. Anthropomorphism is not limited to children. 2. Experience is an important variable.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Crannell (1954)	Investigate animism among college students.	Group testing with 5 alternative questionnaires for each of 10 questions.	Two groups: 1. 163 students in psychology courses. 2. 40 students in second year zoology.	1. 35.6% gave animistic responses. 2. 27.5% gave animistic responses. Substantiated findings of Dennis.	Significant minority of our college students has not even learned "what life is all about."
Bell (1954)	Determine degree of correlation between 2 tests and to test Crannell's conjecture.	Group testing.	Two groups: 1. 519 college students in Dennis' "yes-no" test. 2. 462 in Crannell's type test.	1. 51.6% gave one or more animistic responses most often because it either moved or gave off energy. 2. Negative correlation between grade and number of answers.	Comparable students gave fewer animistic responses on multiple choice type of test than on simple yes-no test.
Lowrie (1954)	Hypothesis: Animism is ignorance of what constitutes the criteria of life rather than believing an inanimate thing is alive.	Group testing with list of 12 objects using same method as Dennis.	Class in general biology.	1. Same results as Dennis. 2. Percentage of students giving incorrect answers increases as the grades become lower. 3. Hypothesis not substantiated.	1. Anthropomorphism is widespread and shouldn't seem alarming even in college students. 2. Animism is due to ignorance and little transfer of learning.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Voeks (1954)	Sources of animism in students.	Group testing employing Dennis' instructions.	155 students.	1. Supports Dennis' findings (a) 43% labeled 1 or more objects as living. 2. 90% of animistic labelers did not include capacity for reproduction, metabolism or both. 3. Most frequent reasons: (1) some use (2) movement (3) affected by environment (4) sustains life (5) chemical changes.	1. Label of "living" arises from other mistakes in reasoning and from semantic difficulties rather than from animism. 2. Most common error in logic: if some attribute is often found in living organisms, possession of that attribute is sufficient for classifying the possessor as living.
Simmons & Goss (1957)	Investigate frequency of animistic responses as a function of various combinations of 2 conditions.	Group testing with list of 10 objects using same method as Dennis.	255 college undergraduates.	1. 64% gave at least one animistic response. 2. Poet instructions produced a significant increase while sentence contexts had no differential effects on frequency of animistic responses. 3. Containing and/or supporting life and movement were most frequently cited as reasons.	1. Sex, religion, and extent of scientific background were unrelated to occurrence of animistic responses. 2. Animistic responses explained in terms of generalization to test words mediated by reasons.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Dennis (1957)	Animistic thinking among college and high school students in the Near East.	Group testing by questionnaire with list of 7 objects.	Five groups: 1. 130 college women. 2. 75 college men. 3. 115 Baghdad students. 4. 286 Mosul Day students. 5. 141 Mosul Night students.	Group 1 - 77% Group 2 - 53% Group 3 - 95% Group 4 - 81% Group 5 - 74%) Gave one or more animistic answers.	1. Animism accounted for in terms of educational handicap rather than in terms of a positive animistic tradition. 2. Animism arises autogenously in individuals who lack an adequate background in modern biological concepts and knowledge. 3. Degree of animistic thinking is probable in some adults in any society.
Crowell & Dole (1957)	Investigate relationship between: 1. Animism and educational experience of college students. 2. Animism and measured college aptitude.	1. Dennis' original statements in a 16 item questionnaire. 2. Ohio State Psychological Exam Forms 23 and 24.	225 University of Hawaii undergraduates.	Freshmen-79% Sophomores-70% Upperclassmen-61%) Gave some evidence of animistic thinking.	1. Moderate inverse relationship between animistic thinking and intelligence level. 2. Specific educational experiences did not seem to have been related to an absence of animistic thinking.

Table 1 (continued)

Investigator	Purpose	Data-gathering Techniques	Subjects	Results	Interpretive Conclusions
Klinberg (1957)	Determine whether: 1. Children attribute life to not-living objects. 2. If (1) is so, the animistic tendency is based on a primitive mental structure.	Interrogation using Huang's methods and 10 objects.	97 children 7-10 years old.	1. Children attribute life to some not-living objects. 2. Distinction between living and not-living is much better applied at this age than Piaget thought.	1. Growth goes not from a universal animism to physicalism but from ignorance to better and better knowledge. 2. Piaget's explanation of animism seems improbable. 3. No findings suggest that children's thinking is a function of a fundamentally other mental structure than that of the adult.

thought processes and/or of his 17 categories of thought (causality). Data on animism were obtained incidentally or were important only in so far as relevant to these more basic hypotheses. The remaining studies focused on characteristics of the occurrence of animistic thinking in children, in senescent adults, and in college students.

4 Hazlitt (1930) was unable to discern Piaget's four stages in childrens' responses to the stimuli and questions of an individual testing situation. The animistic responses which did occur were ascribed to inability to see relations, which, in turn, was viewed as due simply to lack of experience. Furthermore, Piaget's notion of a marked discontinuity between childrens' and adults' thought processes was attributed to his overestimation of verbal expression as a measure of thinking and to his exaggeration of the logicality of adult thought. Since Johnson and Josey (1931-32), 5 who used Piaget's clinical method, also failed to substantiate most of his claims, Hazlitt's contradictory results cannot be ascribed entirely to differences in data-gathering techniques.

6 Abel (1932) observed Piaget's categories of juxtaposition, syncretism, as well as a general reversion to prelogical or infantile modes of verbal expression in adults. Because such types of thinking were directly related to the complexity of the material to be comprehended and remembered, however, she concluded that this was a more important factor

than age.

7 Deutsche (1937) was unable to readily classify responses of children according to Piaget's scheme of 17 types of causal relations. Naturalistic explanations increased and mystic, anthropomorphic, and phenomenalistic accounts of phenomena decreased with age. Animistic answers were infrequent. The 17 categories could not be used for classification of explanations of natural phenomena proffered by the
8 children of Oakes' (1947) study. Nor was there support for Piaget's notions of a stagewise development and qualitative differences between the modes of thinking of children and adults. Thus, four of five studies have failed to obtain findings which are corroborative of various aspects of Piaget's general hypotheses.

Additional negative evidence has been reported by Mead, who found that tendencies of Manus children to spontaneous animistic thought were less than those of adults of that culture. She concluded that such responses are caused by "a potentiality of human mentality under special cultural conditions" (1932, p. 289) rather than by intellectual immaturity per se.

9 In 1939, Russell and Dennis (1939) described a standardized technique for investigating animism in which 20 actual objects or words served as stimuli for responses of living (yes) or non-living (no). Children's responses to these items could be classified in terms of Piaget's four

developmental stages. Subsequently, the same or similar testing procedures have yielded comparable responses by other American white children of urban, suburban, and rural backgrounds (Kotula, 1949; Russell, 1940a; Russell, 1940b), a child of high mental capacity and special nature training (Dennis, 1942), Hopi (Dennis, 1943), and Zuni (Dennis & Russell, 1940) children, and feeble-minded Ss (Russell, Dennis & Ash, 1940). Therefore, these investigators concluded that Piaget's four-stage hypothesis was supported by the developmental trends of animistic responses of children of diverse cultural backgrounds. Bruce (1941) came to a similar conclusion regarding animistic responses of Negro children.

Animistic responses have also been observed in oriental children (Huang, 1943; Huang & Lee, 1945). However, the interpretation of these responses and whether they can be categorized in terms of Piaget's stages are controversial (Strauss, 1951).

Russell (1942) modified the Russell and Dennis procedure for use with groups of older children. Their responses exhibited the same stages of animism as those of younger children. Kotula (1949) confirmed these observations. Responses to the test of animism of 75 per cent of a group of adults, 70 years of age or older, could be placed at a childhood level of development (Dennis & Mallinger, 1949). Those differences between childhood and senescence

which did exist were attributed to the larger vocabularies and better mastery of language in the aged.

Dennis (1953) reported that from 12 to 48 per cent of various groups of college students gave animistic responses to one or more words of an animistic test list. In order to determine whether Dennis' results were peculiar to his testing procedure, Crannell (1954) administered a multiple-choice test of animism. Answers consistent with Dennis' findings were obtained; they indicated that a large proportion of Crannell's Ss were unable to make precise discriminations with respect to the nature of life. Subsequently, Bell (1954) reported that scores for Dennis' and Crannell's tests were positively correlated. However, comparable Ss tended to give somewhat fewer animistic responses to multiple-choice questions.

Lowrie (1954) maintained that college students' ignorance of criteria of life was the primary reason for their considering inanimate things to be living. Accordingly, he explained these criteria and their use to his class in general biology throughout one semester. Administration of a test similar to that used by Dennis at the end of the semester yielded comparable results and indicated that his special instruction had not been markedly successful. However, animistic thinking was still considered a consequence of ignorance complemented by negligible transfer of learning.

The reasons for the animistic responses obtained by

Voeks (1954) frequently involved references to attributes common to many living and nonliving things. She concluded, therefore, that mistakes in reasoning and semantic confusions rather than an underlying animistic mode of thought were responsible for animistic responses.

These findings of animistic responses in natural contexts and in a wide range of test situations by Ss of varying ages and cultural backgrounds served as the starting point for Simmons and Goss' (1957) investigation. Concluding that animistic responses could be considered a well-established descriptive fact, they proposed that more precise specification of antecedents of such responses was required. Therefore, frequency of animistic responses to 10 of Dennis' test words was investigated as a function of (a) prior exposure to those words in scientific, animistic (poetic metaphors), or scientific-animistic sentence contexts, and (b) regular instructions or such instructions plus further statements to respond "like a scientist" or "like a poet." Animistic responses to one or more test words were obtained for 64 per cent of his 255 Ss. Poet instructions increased the mean number of animistic responses from 1.60 to 6.27. However, neither sentence contexts nor interaction of contexts and instructions had differential effects. Sex, religion, and extent of scientific background were also unrelated to animistic responses.

Occurrence of animistic responses was attributed to

response-mediated generalization. Growth, movement, power, heat, and beauty, and other properties common to many living and non-living things - the "reasons" for animistic responses - were the postulated mediating processes. Poet instructions were considered cues for Ss' increased use of such reasons which in turn produced more frequent animistic responses.

Animistic responses have been most recently observed in college and high school students of the Near East (Dennis, 1957), in University of Hawaii undergraduates (Crowell & Dole, 1957) and in Swedish children 7-10 years old (Klinberg, 1957).

Specific theory and objectives

Theory.--The present investigation was designed to test Simmons and Goss' mediated generalization explanation of the occurrence of animistic responses. Figure 1 shows the postulated stimulus-response components and interrelationships in relatively complete fashion. It is assumed that each word of the test list (and, although not shown, the objects to which they refer as well) evoke responses from one or more of three response classes: scientific criteria, animistic reasons, and extraneous associations. The latter class has been labeled extraneous simply because it is a residual one consisting of all associations not included in the first two categories. Classified as scientific criteria are "contractility," "irritability," "metabolism," and

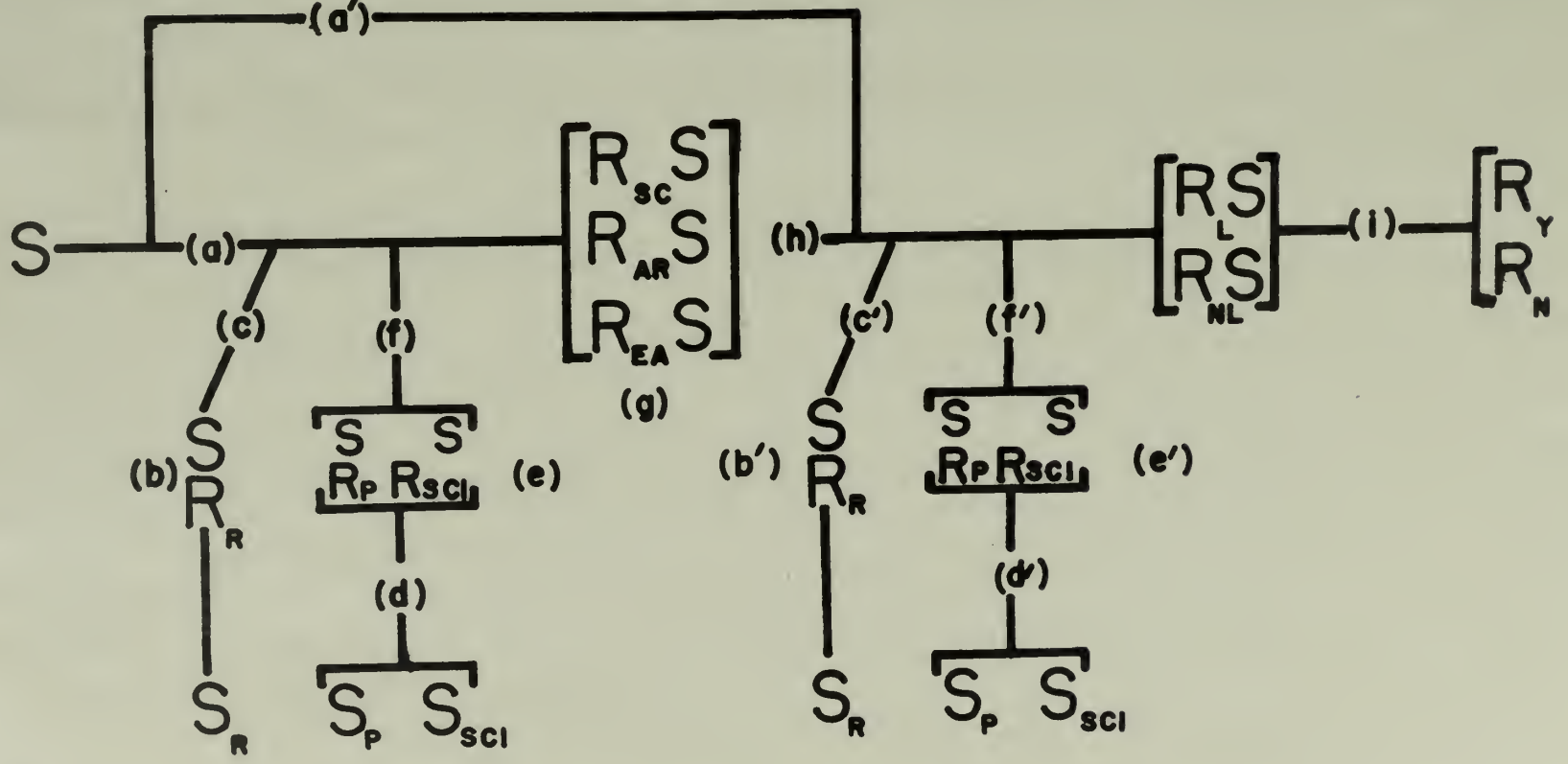

Fig. 1. Postulated stimulus-response analysis of determinants of animistic responses to test words under conditions of differential instructions. See next page for key.

Fig. 1 continued: Key to Components and Conditions or Functions.

Components

S_{TW}: test words

S_R: regular instructions

S_P: poet instructions in addition to regular instructions

S_{Sci}: scientist instructions in addition to regular instructions

R_RS: response to regular instructions and resultant stimuli

R_PS: response to poet instructions in addition to regular instructions and resultant stimuli

$R_{Sci}S$: response to scientist instructions in addition to regular instructions and resultant stimuli

$R_{SC}S$: scientist response and resultant stimuli

$R_{AR}S$: animism response and resultant stimuli

$R_{EA}S$: extraneous association and resultant stimuli

R_LS: "living" response and resultant stimuli

$R_{NL}S$: "nonliving" response and resultant stimuli

R_Y: "yes" response on animistic test

R_N: "no" response on animistic test

Conditions or Functions

(a) Strength of associations between test words and responses in each of those response classes
(b) Presence of stimuli produced by responses to regular instructions
(c) Strength of associations between instruction-induced stimuli and criteria, reason, or extraneous responses
(d) Strengths of associations to those cues
(e) Degree of differences between sets of responses to either instruction and between their respective sets of response-produced stimuli
(f) Strengths of associations between stimuli produced by those responses and criteria, reason, or extraneous responses
(g) Occurrence of criteria, reason, or extraneous responses
(h) Strengths of associations between responses of "living" or "nonliving" and stimuli produced by these responses
(i) Strengths of associations between "living" and checking the "yes" column and between "nonliving" and checking the "no" column

"reproduction" or their negations.[1] Equivalent phrases are also acceptable. These words or phrases may be correctly or incorrectly applied to particular objects.

Animistic reasons are those responses which Ss give as reasons for considering test objects or words living. In general, they are properties common to both living and nonliving things. Examples of these are "movement," "power," "heat," and "beauty." Extraneous associations or responses such as "morning" to sun and "night" to stars, which are neither criteria words nor reasons for animistic responses, might also occur. However, regular test instructions might markedly reduce the number of these associations.

Stimuli produced by scientific criteria or animistic reasons responses to test words might often evoke responses of "life," "living," "alive" or their opposites. Again, regular test instructions could be expected to reduce or eliminate other classes of responses which the stimuli produced by criteria or reasons responses would arouse under

---

1. Not all biologists, biochemists, and biophysicists would agree that all or any combination of these characteristics of "living" things are the most basic or critical differentiae between the "living" and "nonliving." In fact, no qualitative differentiae may prove satisfactory. These characteristics are, however, cited frequently (Anthony, 1946; Carlson & Johnson, 1953; Stackpole & Leavell, 1953). Further, the specific characteristics of the living or words for those characteristics are not critical to the nature of the present analysis of conditions which determine the occurrence of responses of "living" or "nonliving" to words referring to or to actual animate or inanimate things.

somewhat different conditions.

Regular instructions presumably elicit responses which, in most Ss, persist throughout the test. Stimuli produced by these instructions, it has been assumed, limit the number and/or type of criteria and reasons responses and also of responses to the stimuli produced by criteria and reasons responses. By arousing dissimilar sets of responses and, therefore, response-produced stimuli, scientist or poet instructions may bring about further restrictions. Specifically, stimuli produced by responses to the stimulus "like a scientist" may contribute to the evocation of reproduction, metabolism, and other scientific criteria. And movement, power, and other animistic reasons may be direct or indirect consequences of the cue "like a poet."

Instructions to check the "yes" column, if the objects referred to are "living," and the "no" column, if they are "nonliving," presumably assure occurrence of one or the other instrumental response to each test word.

Whether scientific criteria, animistic reasons, or extraneous associations are evoked by test words, then, will be determined by the (a) strength of associations between test words and responses in each of those response classes, (b) presence of stimuli produced by responses to regular instructions, and (c) strengths of associations between regular instruction-induced stimuli and criteria, reason, or extraneous responses. Additional instruction cues of "like a

scientist" or "like a poet" introduce the (d) strengths of responses to those cues, (e) degree of differences between sets of responses to "like a scientist" and to "like a poet" and between their respective sets of response-produced stimuli, and (f) strengths of associations between stimuli produced by those responses and criteria, reasons, and extraneous responses. Presumably, the scientific criteria are most strongly associated with stimuli produced by responses to "like a scientist," whereas stimuli produced by responses to "like a poet" are most likely to elicit animistic reasons or extraneous responses.

Responses of "living" and the like or "nonliving" and its synonyms may be in part functions of these conditions. Primes are used to designate these functions. Also, these responses might be determined by the (g) occurrence of criteria reasons, or extraneous responses and (h) strengths of associations between responses of "living" or "nonliving" and stimuli produced by responses of (g). Finally, (i) strengths of associations between "living" and checking the "yes" column and between "nonliving" and checking the "no" column may sometimes be important; because of instructions, high associative strengths are ordinarily assumed.

Little direct evidence either in support of or inconsistent with this formulation is presently available. Vocks (1954) and Simmons and Goss (1957) found that Ss give different reasons for animistic than nonanimistic responses,

and that the former often referred to properties shared by both living and nonliving things.

Simmons and Goss' failure to obtain differential effects of scientific, animistic, and scientific-animistic sentence contexts may have reflected weak or no associations between aspects of those contexts and mediating scientific criteria or animistic reasons and/or between contexts or criteria and reasons response-produced stimuli on one hand and responses of "living" or "nonliving" on the other. There may also have been insufficient transfer from training experiences to the test situation. Or, the schematized formulation in Figure 1 may be wholly or in part invalid.

Poet instructions produced an increase in animistic responses while scientist instructions had no noticeable effect. However, this finding was not accompanied by observations of the occurrence of sets of responses to "like a poet" which differed from those to "like a scientist." Therefore, no direct evidence of differential responses to these different instructions was available.

A number of other concept-formation situations have been analyzed in similar fashion (Fenn & Goss, 1957; Osgood, 1953). However, the external stimuli, mediating stimuli and responses, and solution responses of those tasks are seemingly quite dissimilar to presumed components of animistic training and test situations. Moreover, data pertinent to the validity of those analyses are incomplete.

Objectives.--There were four general objectives with reference to the diagrammatic scheme of Figure 1. The first objective was to determine the effects on animistic responses of experimental strengthening of associations between test words and scientific criteria or animistic reasons; that is, increasing factor (a). The scientific criteria - noncontractile, nonmetabolic, nonirritable, and nonreproductive - were the negations of the four of the most generally accepted biological criteria of life. "Movement," "power," "beauty," and "heat" were the animistic reasons.

The second objective was to determine the effects on animistic responses of experimental strengthening of associations between words for scientific criteria or the animistic reasons and responses of "living," "alive," or "life"; that is, increasing factor (h). Here, strengthening of scientific criteria responses and "life" responses consisted of associations between "contractile," "irritability," "metabolism," and "reproduction" with "life," "living," or "alive." Or, these responses were associated with the four animistic reasons. In addition, the animistic test was preceded by regular, scientist, or poet instructions. This instruction condition presumably entailed factors b, c, d, e, and f, and also b', c', d', e', f', which, within each set, however, were confounded.

Although the main effect of instructions, specifically of poet instructions, had been demonstrated in Simmons and

Goss' (1957) experiment, several conditions warranted the third objective of this study, - replication of the effects of scientist and poet instructions on animistic responses. One was to ascertain whether the very dramatic increase in mean number of animistic responses from 1.60 to 6.27 would again occur. If such was the case, poet instructions would be clearly established as a reliable technique to assure high frequencies of animistic responses. In subsequent work such high frequencies might often be more satisfactory baselines for measurement of the success of experimental attempts to reduce the occurrence of animistic responses than the markedly lower frequencies associated with regular or scientist instructions.

The fourth objective was to determine the effects on animistic thinking of various combinations of (a) associations between test words and scientific criteria or animistic reasons, (b) associations between words for criteria and reasons and responses of "living," "alive," or "life," and (c) regular, poet or scientist instructions. Lack of knowledge of main and interaction effects of these three experimental conditions precluded exact prediction of the rank-order of all treatment combinations. However, the combination of animistic reasons, strengthening of responses of "alive," "living," and "life" to those reasons, and poet instructions was expected to produce the largest number of animistic responses. The converse was anticipated for

scientist instructions and experimental strengthening of associations between test words and scientific criteria (e.g., nonmetabolic), and between "life" responses and scientific criteria (e.g., metabolism). Other treatment combinations were expected to produce intermediate values.

Method

Subjects

The 270 Ss from classes in introductory psychology at the University of Massachusetts were pre-arranged randomly to 27 experimental groups of 10 each. All were naive with respect to psychological literature on animistic thinking. Although Ss were of varying backgrounds with respect to the type and number of secondary school and collegiate science courses which they had taken, most had or were completing at least six hours of various college-level science courses.

Stimulus materials

Animistic test.--Animistic responses were tested by a list of 10 words: sun, clouds, sea, lightning, wind, stars, earth, match, pearl, gasoline. These were selected from among Russell and Dennis' 20 test objects and words, and had been previously employed by Simmons and Goss (1957), as well as in research on schizophrenic thought at Butler Hospital in Providence, Rhode Island. The 10 words appeared in the first of the four columns of the animistic test sheet (see Appendix). The second and third columns provided space for Ss to check "yes" for living or "no" for nonliving, respectively, as responses to instructions to indicate whether "the object referred to is living or nonliving." Reasons for "yes" or "no" responses to each word were written in the fourth column.

The reliability of test scores has been determined in two ways. First, scores made by a random sample of 60 Ss during participation in the experiment were correlated with their scores on the test when administered in a classroom situation two months later. This test-retest value was +.72. Also, the test was divided into halves which had essentially equivalent total scores and distributions of scores for the five words of each. Simmons and Goss (1957) found a correlation of +.83 between these halves; the value for the present study was +.82. These coefficients yield split-halves estimates of the reliability of the 10-word test of +.91 and +.90, respectively (Guilford, 1950).

Paired-associates lists.--Table 2 presents the paired-associates lists for strengthening associations between scientific criteria and responses of "life," "alive," "living," and between animistic reasons and the same responses.

Power, movement, and heat were used as animistic reasons because they were unitary words, applicable to most of the test words, and frequently given as reasons for animistic responses (Simmons & Goss, 1957). "Beauty" was added to have a more appropriate word for "pearl" as well as one word with relatively few physical-chemical associations.

In order to counterbalance possible effects of specific stimulus-response associations, three sublists were constructed so that each response word was paired with each stimulus word. Four different random orders of the paired-

Table 2

Paired-associates Lists for Associations between Scientific Criteria or Animistic Reasons and "Life" Responses

Type of Stimuli	Stimulus (Criteria)	Response (Concept)		
Scientific	Contractile	life	living	alive
	Irritable	alive	life	living
	Metabolic	living	alive	life
	Reproduction	alive	life	living
	Stimulus (Reasons)	**Response (Concept)**		
Animistic	Beauty	alive	life	living
	Heat	living	alive	life
	Movement	alive	living	life
	Power	life	living	alive

associates of each sublist were then prepared to minimize effects of serial learning.

The paired-associates lists for strengthening associations of test word stimuli to scientific criteria or animistic reasons responses are shown in Table 3. The four scientific criteria were randomly assigned to the 10 test words. Whenever possible, however, frequently given reasons for animistic responses to particular words were assigned as responses to those words (Simmons & Goss, 1957). Serial learning was minimized by use of four different random orders of the pairs of each list.

Henceforth, the former lists (Table 2) will be designated "life responses lists" and the latter (Table 3) as "criteria-reasons lists." Both sets were presented by a group technique recently devised by Saltz and Meyer (1955). This technique required preparation of a set of learning booklets and a test booklet for each of the three sublists of the two life responses lists and for each of the two criteria-reasons lists.

Each learning booklet consisted of either four pages, one for each of the paired-associates of the life responses lists, or 10 pages, one for each of the criteria-reasons lists. Since there were four random orders of each of the life responses and criteria-reasons lists, four booklets, each presenting the pairs of a given list in different random orders, were constructed for each list. These sets

Table 3

Paired-associates Lists for Associations between Test Words and Scientific Criteria or Animistic Reasons

Scientific List		Animistic List	
Stimulus	Response	Stimulus	Response
Sun	Non irritable	Sun	Heat
Clouds	Non contractile	Clouds	Beauty
Sea	Non reproductive	Sea	Movement
Lightning	Non contractile	Lightning	Power
Wind	Non contractile	Wind	Movement
Stars	Non metabolic	Stars	Beauty
Earth	Non reproductive	Earth	Movement
Match	Non reproductive	Match	Heat
Pearl	Non irritable	Pearl	Beauty
Gasoline	Non metabolic	Gasoline	Power

of four orders of each list were numbered and stapled to different quadrants of a 8 1/2 x 11 in. sheet of heavy posterboard.

The test booklets for life responses and criteria-reasons lists were five or 10 pages, respectively. Each page consisted of a list of only stimulus members of the paired-associates in the same order as they had appeared in the just preceding learning booklet. The test booklet for each list was stapled on the side of the posterboard opposite the learning booklets.

Questionnaire.--A questionnaire (see Appendix) was prepared to determine whether Ss (a) attribute different sets of characteristics to poets than to scientists, and (b) indicate or believe that scientists are more likely than poets to use scientific criteria as responses to test words and that poets are more likely than scientists to give animistic reasons for responses to test words.

This questionnaire was based on a preliminary study in which a somewhat different questionnaire (see Appendix) was administered to 40 college sophomores enrolled in the introductory psychology course. The objectives were: (a) to obtain rank-orders of Ss familiarity with the greatest poets and scientists of all times of any country or language, (b) to ascertain the traits or attributes which these Ss felt best described poets and scientists, and (c) to determine how college sophomores think poets and scientists would

describe or characterize the objects or happenings to which the words of the animistic test refer.

Procedure

Table 4 summarizes the three-dimensional factorial design employed. One factor consisted of conditions of associating scientific criteria (S) or animistic reasons (A) with life responses; that is, learning one or the other of the life responses paired-associates. In addition, there was a no-learning or control (C) condition. The second factor consisted of learning either scientific criteria (Sc) or animistic reasons (An) responses to test words and a no-learning or control (Co) condition. Each of these nine combinations of acquisition of life responses and/or criteria-reasons was combined with scientist (Sci), poet (P), and regular (R) instructions.

The sequences of letters within each of the 27 cells of Table 4 are the abbreviations which will be used to designate particular treatment combinations. For example, A-An-P represents the combination or group which learned associations between animistic reasons and life responses (A), acquired animistic reasons responses to words (An), and was instructed to respond like a poet (P).

All 10 Ss within each of the 27 treatment combinations were run simultaneously. Table 5 shows the order of occurrence of these 27 combinations both within and among evenings. Three combinations were administered on each evening.

Table 4

Summary of Three-dimensional Factorial Design with Experimental Condition. N = 10 in each Cell.

Criteria or Reasons Associations	Test Word Associations								
	Animistic (An)*			Control (Co)			Scientific (Sc)		
	Instructions			Instructions			Instructions		
	Poet (P)	Regular (R)	Scientist (Sci)	P	R	Sci	P	R	Sci
Animistic (A)	A-An-P**	A-An-R	A-An-Sci	A-Co-P	A-Co-R	A-Co-Sci	A-Sc-P	A-Sc-R	A-Sc-Sci
Control (C)	C-An-P	C-An-R	C-An-Sci	C-Co-P	C-Co-R	C-Co-Sci	C-Sc-P	C-Sc-R	C-Sc-Sci
Scientific (S)	S-An-P	S-An-R	S-An-Sci	S-Co-P	S-Co-R	S-Co-Sci	S-Sc-P	S-Sc-R	S-Sc-Sci

*Abbreviations for specific treatment categories of each of the three conditions in parentheses.

**Abbreviations designating specific treatment combinations.

Table 5

Order of Occurrence of the 27 Experimental Combinations both Within and Among Evenings

Evenings	Order of Sessions		
	1	2	3
1	A-An-P	C-Co-Sci	S-Sc-R
2	S-Co-R	A-Sc-P	C-An-Sci
3	C-Sc-Sci	S-An-R	A-Co-P
4	C-Sc-R	S-An-P	A-Co-Sci
5	A-An-Sci	C-Co-R	S-Sc-P
6	S-Co-P	A-Sc-Sci	C-An-R
7	S-Co-Sci	A-Sc-R	C-An-P
8	C-Sc-P	S-An-Sci	A-Co-R
9	A-An-R	C-Co-P	S-Sc-Sci

Each condition of each factor preceded and followed other conditions of that factor an approximately equal number of times. Thus, differential consequences of Ss of one combination passing information to Ss of subsequent combinations were counterbalanced for main effects and first-order interactions. This was not the case for the second-order interaction. The usual precaution of warning Ss not to tell anything of what happened to them to anyone else was taken. Questioning of selected Ss indicated that this request had been observed, at least insofar as their answers were representative and valid.

Specific procedures for the administration of the two associative learning tasks, the animistic test, and the questionnaire are described below.

Associations between criteria or reasons and life responses.--Ss were given five trials to learn either scientific criteria-life responses or animistic reasons-life responses lists. Five trials was selected on the basis of preliminary experimentation which indicated that, on the average, Ss would be making 90 per cent correct responses by the fifth trial. Nine groups learned the science criteria-life responses list and an equal number acquired those responses to animistic reasons.

The learning materials were placed on the arms of the chairs in which Ss were seated. They were instructed to study and learn the lists so that when given the first or

stimulus word alone, the second or response word of each pair could be correctly written (see Appendix for specific instructions). On the first trial Ss were told to use a particular booklet. This was randomly selected. When signalled to start, the cover page of that booklet was turned and Ss looked at the first pair of associates. On a signal, 4 sec. later, they turned to the second pair which was also seen for 4 sec. After the last pair had been seen for 4 sec., Ss turned over the posterboard and attempted to write the correct response member after each of the four stimulus words alone. Sixteen sec. were allowed for those responses. During the 30-sec. intertrial interval, the filled-in page of the test booklet was torn off and passed to E's assistant. The remaining four trials were administered in the same manner. Order of use of the booklets was random.

Association of test words with scientific criteria or animistic reasons responses.--Preliminary experimentation had indicated that Ss would acquire scientific criteria or animistic reasons responses to test words at about equal rates and that, on the average, a level of 90 per cent or more correct associations would be achieved by the tenth trial. Nine groups learned the test word-scientific criteria list, three immediately after acquiring the scientific criteria-life responses associations, three immediately after acquiring animistic reasons-life responses associations, and three with no prior learning experiences. The

latter were the controls for the first learning task. Nine additional groups with similar experiences with one or the other life responses lists or which had been controls, learned test word-animistic reasons associations. The same group technique for learning was used except that, on each trial, Ss saw each one of the 10 pairs for 4 sec. each, and for test lists they had 40 sec. to write associations to stimulus words alone.

Animistic test and set-inducing instructions.--After life responses and/or criteria-reasons lists had been learned, Ss were introduced to the animistic test with scientist (Sci), poet (P), or regular (R) instructions (see Appendix). The specific additional instructions for the scientist set were:

> "In deciding whether the object is living or not living, I want you to respond or decide as if you were a scientist. For example, Finstein, Newton, Madam Curie, or Pasteur.[2] Are there any questions? All right, go ahead like a scientist would."

and those for the poet set were:

> "In deciding whether the object is living or not living, I want you to respond or decide as if you were a poet. For example, Shakespeare, Frost, Longfellow, or Homer.[2] Are there any questions? All right, go ahead like a poet would."

---

2. These scientists and poets were those mentioned most frequently in response to questions in the preliminary questionnaire to name the five (5) men or women you consider to be the greatest scientists (poets) of all time of any country or language.

As noted above, each of these instruction conditions was administered to each of the nine combinations of acquisition of life responses and criteria-reasons lists and of their controls.

Questionnaire.--All Ss took the questionnaire immediately after completion of the animistic test. The list of 22 traits, which ran down the center of the first two pages, was flanked on both sides by a column of blank spaces. The heading of one column of blank spaces was "characterize poets" and of the other, "characterize scientists." Ss were instructed to proceed down each column of blank spaces and to check those traits which they considered typical or characteristic of either scientists or poets.

The last three pages consisted of a center column of 10 animistic test words. Under each word were to be found two scientific and two animistic words or phrases which have been used to characterize objects referred to by the test words. The orders of scientific and animistic phrases under each test word were determined randomly. Each of the four words or phrases under each test word was flanked on both sides by a blank space. One of these columns of blank spaces was headed "poet would use" and the heading of the other was "scientist would use." Ss were instructed to proceed down these columns and check each word or phrase according to whether they thought a scientist or poet would be most likely to use that word or phrase to describe or to

characterize the object or events referred to by the animistic test words.

Results

Associative learning

Life responses lists.--Table 6 summarizes means and SDs of correct associations per trial between criteria or reasons stimuli and "life" responses for all 18 groups on both the fifth trial and for all five trials. Fifth trial means varied from 3.6 to 4.0. Thus, all groups were responding at or above a criterion of 90 per cent correct response. The F of 1.25 (Table 7) for differences among these means was not significant at the five per cent level. Mean correct responses per trial for all five trials ranged from 3.1 to 3.6 (Table 6). The F (Table 7) for differences among these means was also nonsignificant.

Criteria or reasons lists.--Means and SDs of correct associations per trial between test word stimuli and criteria or reasons responses for all 18 combinations both on the tenth trial and for all 10 trials are summarized in Table 8. Tenth-trial means varied from 8.6 to 10.0 or from 86 to 100 per cent correct, respectively. The F of 1.96 (Table 9) for these differences was significant at less than the .01 level. Inspection of Table 8 suggested that this F reflected the occurrence of somewhat fewer correct scientific criteria than animistic reasons responses. That this was the case was indicated by a t of 4.94 (<.01; 176 df) for the difference between the general mean of 9.0 for the nine

Table 6

Means and SDs of Numbers of Correct Responses per Trial on both the Fifth Trial and for all Five Trials for the 18 Groups which Acquired "Life" Responses to Scientific Criteria or Animistic Reasons Stimuli

Group	Trial 5		Trials 1-5	
	Mean	SD	Mean	SD
A-An-P	3.8	0.4	3.3	1.0
A-Sc-P	4.0	0.0	3.4	1.0
A-Co-P	3.9	0.3	3.1	0.9
A-An-Sci	3.9	0.3	3.4	0.9
A-Sc-Sci	4.0	0.0	3.5	0.9
A-Co-Sci	3.9	0.3	3.6	0.7
A-An-R	4.0	0.0	3.3	1.0
A-Sc-R	4.0	0.0	3.2	1.0
A-Co-R	4.0	0.0	3.3	1.0
S-An-P	3.7	0.6	3.2	1.0
S-Sc-P	3.8	0.4	3.3	0.9
S-Co-P	3.8	0.4	3.1	0.9
S-An-Sci	4.0	0.0	3.3	1.0
S-Sc-Sci	3.6	0.6	3.2	1.1
S-Co-Sci	3.9	0.3	3.4	0.8
S-An-R	3.6	0.6	3.3	0.9
S-Sc-R	3.8	0.4	3.3	1.0
S-Co-R	3.9	0.3	3.4	0.8

Table 7

Analysis of Variance of Means of Correct "Life" Associations per Trial for the Fifth Trial and for all Five Trials

Source	df	Trial 5		Trials 1-5	
		MS	F	MS	F
Between groups	17	0.20	1.25	0.16	0.89
Within groups	162	0.16		0.18	
Total	179				

Table 8

Means and SDs of Numbers of Correct Responses per Trial on both the Tenth Trial and for all 10 Trials for the 18 Groups which Acquired Scientific Criteria or Animistic Reasons Responses to Test Words

Group	Trial 10		Trials 1-10	
	Mean	SD	Mean	SD
A-An-P	9.7	0.9	9.5	1.4
A-Sc-P	9.2	1.4	8.6	2.0
A-An-Sci	9.9	0.3	9.9	0.4
A-Sc-Sci	9.6	0.5	8.4	2.0
A-An-R	10.0	0.0	9.7	1.2
A-Sc-R	9.0	1.8	8.1	2.2
S-An-P	10.0	0.0	9.9	0.3
S-Sc-P	8.6	1.6	7.1	2.7
S-An-Sci	9.9	0.3	9.9	0.4
S-Sc-Sci	9.0	1.8	7.6	2.7
S-An-R	9.7	0.4	9.8	0.8
S-Sc-R	8.7	2.0	7.7	2.2
C-An-P	10.0	0.0	9.9	0.4
C-An-Sci	9.9	0.3	9.7	0.9
C-An-R	10.0	0.0	9.7	0.7
C-Sc-P	9.6	0.7	7.7	2.3
C-Sc-Sci	9.0	1.4	7.0	2.7
C-Sc-R	8.8	1.5	7.0	2.8

Table 9

Analysis of Variance of Means of Correct Criteria or Reasons Associations per Trial for the Tenth Trial and for all 10 Trials

Source	df	Trial 10		Trials 1-10	
		MS	F	MS	F
Between groups	17	2.56	1.96*	13.40	13.53**
Within groups	162	1.30		0.99	
Total	179				

*Significant at .05 level.

**Significant at <.001 level.

scientific criteria groups combined and the general mean of 9.9 for all nine animistic reasons groups. Nonsignificant F's of 0.94 and 0.52 (Table 10) were obtained for differences among the nine means for criteria groups and among the nine means for reasons groups, respectively.

Differences among mean correct responses per trial over the 10 trials exhibited a similar pattern. That is, the F (Table 9) for differences among the means of all 18 groups was highly significant as was the t of 13.64 (<.001; 176 df) for the differences between the general mean of 7.7 per trial for the nine scientific criteria groups and that of 9.8 per trial for the nine animistic reasons groups. The F's for differences within each of these sets of nine groups were not significant (Table 11). Thus, both measures support a conclusion of somewhat slower learning and lower terminal trial achievement for scientific criteria than for animistic reasons responses.

Animistic responses

Scores for the animistic test ranged from zero for no words responded to with "yes to 10 for all 10 words checked "yes." Means of these scores for the 27 treatment combinations were as low as 0.3 for the S-An-R combination and as high as 6.6 for Ss in the A-Co-P group (Table 12). At least one animistic response was made by 63 per cent of all Ss and by 20 per cent or more of the Ss of each combination. Every S in the S-Sc-P, S-An-P, A-An-P, A-Co-P, and C-Co-P groups

Table 10

Analysis of Variance of Means of Correct Associations on the Tenth Trial for the Nine Scientific Criteria Groups and for the Nine Animistic Reasons Groups

Source	df	Scientific Criteria		Animistic Reasons	
		MS	F	MS	F
Between groups	8	1.28	0.52	0.15	0.94
Within groups	81	2.45		0.16	
Total	89				

Table 11

Analysis of Variance of Means of Correct Associations per Trial for all 10 Trials for the Nine Scientific Criteria Groups and for the Nine Animistic Reasons Groups

Source	df	Scientific Criteria		Animistic Reasons	
		MS	F	MS	F
Between groups	8	3.42	1.92	0.22	1.05
Within groups	81	1.78		0.21	
Total	89				

Table 12

Means and SDs of Frequencies of Animistic Responses for all 27 Combinations

Combinations	Mean	SD
A-An-P	6.0	2.2
A-Sc-P	5.5	2.5
A-Co-P	6.6	2.9
S-An-P	6.3	2.5
S-Sc-P	5.8	2.1
S-Co-P	6.0	1.8
C-An-P	4.0	2.0
C-Sc-P	5.8	2.2
C-Co-P	6.2	2.5
A-An-Sci	1.8	0.7
A-Sc-Sci	1.3	1.5
A-Co-Sci	1.2	0.9
S-An-Sci	2.2	1.7
S-Sc-Sci	1.7	1.5
S-Co-Sci	1.1	1.1
C-An-Sci	3.4	1.8
C-Sc-Sci	1.5	1.7
C-Co-Sci	1.8	1.8
A-An-R	2.8	1.9
A-Sc-R	1.4	1.3
A-Co-R	0.8	0.7
S-An-R	0.3	0.6
S-Sc-R	1.2	1.2
S-Co-R	1.3	1.2
C-An-R	1.3	1.3
C-Sc-R	1.6	1.4
C-Co-R	2.1	1.1

checked "yes" three times or more.

The three-dimensional analysis of variance summarized in Table 13 indicates that instructions had a significant effect. This was due to marked increases in the animistic responses of all nine groups which had been given poet instructions. Neither acquisition of scientific criteria or animistic reasons responses to test words nor of life responses to those criteria reasons either alone or in various combinations influenced animistic responding. Nor were any of the interactions significant.

Since scientific criteria responses to test words were not learned as rapidly or as well as animistic reasons, there was a possibility that this initial difference in mastery might have accounted for the apparent ineffectiveness of acquisition of criteria or reasons lists. If so, analysis of covariance should be employed to compensate for any effects of differential mastery of those responses to test words. Since analysis of covariance presupposes correlations between learning scores of criteria-reasons lists and animistic test scores, these were computed for those scientific and regular instruction groups combined and for those poet instruction groups which had had the same combinations of the two learning tasks. Scientific and regular instruction groups were combined because their animistic test scores did not differ significantly and the combined scores would give rs based on more df. Because of

Table 13

Analysis of Variance of Means of Animistic Responses

Source	df	MS	F
Specific Associations (A)	2	1.48	-
Criteria Associations (C)	2	1.03	-
Instructions (I)	2	532.04	98.52*
I x C	4	7.17	1.32
I x A	4	7.41	1.37
C x A	4	3.05	-
I x C x A	8	6.18	1.14
Within (error)	243	5.40	
Total	269		

*Significant at < .001 level.

homogeneity of tenth-trial scores within these groups, only the correlations between correct responses per trial over the 10 trials and animistic test scores were computed. Since none of the resultant rs (Table 14) was significant at the .05 level, analysis of covariance was not indicated. That is, differences in mastery of scientific criteria or animistic reasons responses to test words were not related to animistic test scores.

Table 15 shows the number of animistic responses to each of the 10 test words for each of the 27 treatment combinations. In order to assess main and interaction effects of the different words, a score of "1" was assigned to "yes" responses and of "0" to "no" responses. Although application of analysis of variance to such scores is unorthodox, Cochran (1950) has suggested and justified its use with scores of "1" and "0" obtained by somewhat similar assignment of numerical values.

Since each S responded to all 10 words, words were the basis of "within Ss" sources of the "mixed-type" analysis of variance (Lindquist, 1953) of Table 16. Instructions, words, and their interaction gave rise to F's significant at less than the .001 level. None of the other sources had significant effects. The interaction was due to differences among words in the absolute increases in animistic responses to test words produced by poet instructions. These increases from the scientist and regular instruction baseline ranged

Table 14

Correlations Between Animistic Responses and Correct Associations per Trial for the 10 Trials with Criteria-Reasons Lists for Scientific and Regular Groups Combined and for Poet Groups which Had Had the Same Combinations of Learning Tasks

Groups			df	r
A-An-Sci	and	A-An-R	18	0.07
A-Sc-Sci	and	A-Sc-R	18	0.07
S-An-Sci	and	S-An-R	18	0.15
S-Sc-Sci	and	S-Sc-R	18	0.07
C-An-Sci	and	C-An-R	18	0.03
C-Sc-Sci	and	C-Sc-R	18	0.18
A-An-P			8	0.43
A-Sc-P			8	0.19
S-An-P			8	0.06
S-Sc-P			8	0.43
C-An-P			8	0.40
C-Sc-P			8	0.14

Table 15

Frequencies of Animistic Responses to Each Test Word for all 27 Groups

Groups	Test Words										Total
	Sea	Earth	Sun	Stars	Wind	Lightning	Clouds	Pearl	Match	Gasoline	
A-An-P	10	7	6	7	8	6	7	3	3	3	60
A-Co-Sci	5	4	4	2	1	1	0	1	0	0	18
S-Sc-R	2	3	1	1	2	0	2	1	0	0	12
S-Co-R	4	3	1	1	0	1	0	1	1	1	13
A-Sc-P	8	7	6	6	6	8	8	3	2	1	55
C-An-Sci	5	7	4	5	2	4	2	2	1	2	34
C-Sc-Sci	4	3	3	1	0	0	0	4	0	0	15
S-An-R	2	1	0	0	0	0	0	0	0	0	3
A-Co-P	8	10	8	8	8	7	7	8	2	0	66
C-Sc-R	5	3	0	1	1	1	1	2	2	0	16
S-An-P	10	9	10	5	7	5	4	6	4	3	63
A-Co-Sci	2	2	3	1	1	1	0	1	1	0	12
A-An-Sci	3	3	2	2	1	1	1	2	2	1	18
C-Co-R	2	3	3	2	3	2	3	3	0	0	21
S-Sc-P	9	7	7	6	9	4	5	5	3	3	58
S-Co-P	8	5	6	7	8	6	7	7	4	2	60
A-Sc-Sci	4	4	2	1	0	1	0	0	0	1	13
C-An-R	4	3	2	0	1	1	1	0	0	1	13
S-Co-Sci	3	3	1	1	0	0	0	2	0	1	11
A-Sc-R	3	4	2	2	0	1	1	1	0	0	14
C-An-P	8	5	6	4	4	4	4	3	1	1	40
C-Sc-P	8	7	8	6	9	5	6	4	3	2	58
S-An-Sci	4	5	2	5	1	1	0	2	1	1	22
A-Co-R	0	2	1	2	1	1	0	1	0	0	8
A-An-R	5	6	4	3	3	3	3	1	0	0	28
C-Co-P	9	8	9	8	8	4	7	4	3	2	62
S-Sc-Sci	4	4	3	2	1	2	0	0	1	0	17
Total	139	128	104	89	85	70	69	67	34	25	

Table 16

Analysis of Variance of Means of Frequencies of Animistic Responses to Each Test Word for all 27 Groups

Source	df	MS	F
Instructions (I)	2	53.20	98.51*
Criteria Associations (C)	2	0.10	-
Specific Associations (A)	2	0.15	-
I x C	4	0.72	1.33
I x A	4	0.74	1.37
C x A	4	0.30	-
I x C x A	8	0.62	1.14
Between (error)	243	0.54	
Words (W)	9	4.93	46.07*
C x W	18	0.12	1.12
A x W	18	0.10	-
I x W	18	0.78	7.28*
C x I x W	36	0.10	-
A x I x W	36	0.09	-
C x A x W	36	0.11	1.02
A x C x I x W	72	0.11	1.02
Within (error)	2187	0.107	
Total	2699	0.21	

*Significant at <.001 level.

from only 13 for gasoline to 56 for wind. This is shown in Table 17 which gives frequencies of animistic responses to each word by Ss in all 27 combinations and in the combinations which had scientist, regular, and poet instructions. Also given are absolute and percentage increases for each word under poet instructions. These absolute and percentage values were calculated with the average of the frequencies for the other two instruction conditions as the baseline.

Percentage increases under poet instructions were an inverse function of frequencies of animistic responses under scientist and regular instructions. When rank-orders of percentage increases and of average frequencies under scientist and regular instructions were correlated the rho was -0.88 which is significant at the .01 level.

Although poet instructions produced greater increases for some words than for others, rank-orders of words with respect to their frequencies within each of these conditions were similar. The coefficient of concordance for these ranks was 0.47 which is significant at the .05 level.

Reasons for responses

The categories of reasons for animistic responses of Table 18 were those employed previously (Simmons & Goss, 1957); each is accompanied by illustrative instances. Table 19 gives the categories for nonanimistic responses along with representative instances of each. Interjudge reliability of assignment of reasons for animistic and

Table 17

Frequency of Animistic Responses to Test Words for all Ss and for Ss in each Instruction Condition as well as Absolute and Percentage Increases Due to Poet Instructions

Words*	All	Instruction Conditions**			Absolute Increase***	Percentage Increases
		Scientist	Regular	Poet		
Sea	139	34	27	78	47.5	155.7
Earth	128	35	28	65	33.5	106.3
Sun	104	24	14	66	47.0	247.4
Stars	89	20	12	57	41.0	256.2
Wind	85	7	11	67	58.9	644.4
Lightning	70	11	10	49	38.5	366.7
Clouds	69	3	11	55	48.0	685.7
Pearl	67	14	10	43	31.0	258.3
Match	34	6	3	25	20.5	455.6
Gasoline	25	6	2	17	13.0	325.0

*Arranged in order of decreasing frequency for all Ss.

**Since the number of Ss in each instruction condition was equal, only frequencies are presented.

***Absolute increase from a baseline which is the average of animistic responses under scientist and regular instructions.

Table 18

Reasons Categories with Examples of Animistic Responses which were Scored as falling into these Categories

Category	Abbreviation	Examples
Movement	M	Seem like lazy people just floating by enjoying life to the fullest. Has movement. Always in motion. Moving thing acting under its own power. Movement without external force from man. They move and drift. Rises in the morning and sets in the evening.
Contains life	CL	Community of animals. Has many living things in it. Made up of living materials and living things. Teems with living things. Contains life. Composed of living molecules. Contains living organisms. Living things make it up.
Produces effects	E	You can feel it and see it. Brightens sky in midst of darkness. Makes sounds. Touches one gently or quite roughly. Produces effects on nature or humanity. Gives life and can make things move. Produces sensations.
Power and/or force	P & F	Source of power and force. Because of its potential energy, it is forceful and can destroy things. Fury of it seems human. It is wild, destructive and has great strength. Has power of a giant. Possesses an unpredictable force.
Changes and/or grows	C & G	They grow and become either beautiful or ugly. They are always changing forms. It has many changes occurring by the minute. Has continually changing moods. Because they can grow. Exhibits random and/or startling change. Always changing from calmness to fierceness.

Table 18 continued

Category	Abbreviation	Examples
Beauty	B	Things of beauty. Something lovely and beautiful. Symbol of beauty. Their exquisite beauty is almost heavenly. Mystic beauty. Nature's expression of her beauty. Exemplars of whiteness and purity. It radiates beauty.
Super-natural	Sup	Symbolic of the pagan gods. Symbol for God or some other ethereal power. God's hand in wrath. The tool of the devil. Acts like a God displeased with his people.
Heat	H	We can feel the heat coming from it. It is our source of daily heat. It gives off heat. Radiates heat energy. Warm like a human body. It gives off its own heat.
Product of a living thing	PL	Comes from a living organism. Emerges from a living creature. Comes from living material. Arises from living matter. Comes from life. Produced by a living object.

Table 19

Reasons Categories with Examples of Nonanimistic Responses which were Scored as falling into these Categories

Category	Abbreviation	Examples
Chemical Composition	CC	Gaseous material. Liquid hydrocarbon. Electrical energy. An organic compound. Masses of water vapor. Caused by differences in atmospheric pressure and temperature. Chemical compound.
Reproduction	Rep	Must be explicitly stated as such in reason.
Unclassified	Unc	An object of the physical world. I don't know. A match is a match is a match. Exists in outer space. No proof it is living. Too far away to be living. A medium for organic life.
Inorganic	InO	Inorganic substance. Nothing organic in it. An inorganic compound. An inorganic mass. Made of elements which are inorganic. Inorganic entities and/or constituents.
Metabolism	Met	Must be explicitly stated as such in reason.
Neither Plant nor Animal	NPA	Not existing in any plant or animal form. Neither a plant nor an animal. Has no life in plant or animal sense. Has no senses like plants or animals have.
Artificial	Art	It is man made. Man made object. Man can make them. Manufactured object. A product of man.
Irritable	Irr	Must be explicitly stated as such in reason.
Movement	Mov	No control over its own movement. No intrinsic movement. No movement without external force. Have no movement. Does not exhibit motion alone. Don't move under their own power.

Table 19 continued

Category	Abbreviation	Examples
Protoplasm	Pro	Is not composed of protoplasm. Has no protoplasm. Contains no protoplasm. No visible evidence of protoplasm. Does not contain living protoplasm.
No Feeling	NF	Has no feeling. Does not sense things. They are without feelings. No feeling or desire.
Inanimate	InA	Made of inanimate elements. It is an inanimate object. Composed of inanimate compounds.
Supernatural	Sup	An element of nature. An evil warning or a sign of the devil. No will. Not caused by any internal life. Governed by natural laws. Has no soul. Phenomenon of nature. Expression of God's word.
Duration	Dur	It can evaporate. Not lasting. Appears at times then disappears. Lasts indefinitely. Can dissipate itself completely. It occurs sporadically. Neuter object used but once. Momentary use.
Growth	Gr	Does not grow. No growth by itself. Doesn't change nor grow. Will not grow. Does not grow continually.
Not Material	NMa	Intangible. Too much like vapor and therefore too immaterial. Can't get hold of it. Can't see it. Not a material object. No body.
Function	Fun	No useful purpose. Cannot function alone. No function for life. Has no use or function in and for itself. Can do nothing by itself.
Contractile	Con	Must be explicitly stated as such in reason.
Not Dynamic	NDy	It is inert and not dynamic. No dynamic characteristics in itself.

nonanimistic responses into these two sets of categories was obtained by comparing two judges' classification of the 810 reasons in 81 randomly selected protocols. The writer was one judge. The other was an advanced graduate student in psychology who had had considerable experience in scoring projective test protocols obtained for both clinical and research purposes. There was disagreement on only three of the 810 reasons, or 99.6 per cent agreement.

Reasons for animistic responses.--Table 20 gives frequencies of use of each class of reasons for animistic responses for each test word for sets of nine groups which had the same instruction conditions. In Table 21 instruction conditions have been disregarded.

For all 10 words, Ss given scientist and regular instructions used "movement" and "contains life" most frequently. Poet instructions increased reasons in E, P&F, C&G, and B categories.

"Movement" occurred with significant frequencies for animistic responses to all words but pearl, match, and gasoline. Only "sea" and "earth" brought forth "contains life" as an important reason. Poet instructions produced increases in E reasons for all but pearl; in P&F reasons for all but cloud, pearl, and match; and in C&G reasons for all but gasoline. Frequency of use of "beauty" also increased but only for stars and pearl. Although "supernatural" did not occur with high frequencies to any single word, it was

Table 20

Frequencies of Reasons for Animistic Responses to Each Word Separately and Combined for Each of the Instruction Conditions

Instructions	Reasons	Words										Total
		Sea	Earth	Sun	Stars	Wind	Lightning	Clouds	Pearl	Match	Gasoline	
Scientist (Sci)	M	7	2	4	3	2	3	1	0	0	0	22
	CL	21	30	3	10	0	1	2	0	1	0	68
	E	3	0	5	1	1	3	0	0	0	0	13
	P & F	2	0	3	0	3	3	0	0	1	2	14
	C & G	0	2	1	2	0	0	0	1	1	1	8
	B	0	0	0	0	0	0	0	1	0	0	1
	Sup	1	1	2	0	1	1	0	0	0	0	6
	H	0	0	6	4	0	0	0	0	1	0	11
	PL	0	0	0	0	0	0	0	12	2	3	17
	Total	34	35	24	20	7	11	3	14	6	6	160
Regular (R)	M	5	4	6	4	7	5	5	0	0	0	36
	CL	21	21	0	1	0	1	1	0	0	0	45
	E	0	1	2	1	3	0	0	0	3	0	10
	P & F	0	0	2	1	1	2	1	0	0	2	9
	C & G	0	1	0	1	0	0	3	1	0	0	6
	B	0	0	0	0	0	0	0	0	0	0	0
	Sup	1	1	2	2	0	1	1	1	0	0	9
	H	0	0	2	2	0	1	0	0	0	0	5
	PL	0	0	0	0	0	0	0	8	0	0	8
	Total	27	28	14	12	11	10	11	10	3	2	128
Poet (P)	M	41	17	14	9	19	19	33	0	2	1	155
	CL	14	34	0	2	0	0	0	1	0	0	51
	E	4	5	17	10	23	4	6	0	9	7	85
	P & F	10	2	6	2	9	18	0	0	0	7	54
	C & G	8	4	3	4	12	3	9	2	8	1	54
	B	0	0	1	21	0	0	5	29	0	0	56
	Sup	1	3	9	5	4	5	2	2	1	1	33
	H	0	0	16	4	0	0	0	0	4	0	24
	PL	0	0	0	0	0	0	0	9	1	0	10
	Total	78	65	66	57	67	49	55	43	25	17	522

Table 21

Frequencies of Reasons for Animistic Responses to Each Word Separately and Combined

Objects	Reasons									Total
	M	CL	E	P&F	C&G	B	Sup	H	PL	
Sea	53	56	7	12	8	0	3	0	0	139
Earth	23	85	6	2	7	0	5	0	0	128
Sun	24	3	24	11	4	1	13	24	0	104
Stars	16	13	12	3	7	21	7	10	0	89
Wind	28	0	27	13	12	0	5	0	0	85
Lightning	27	2	7	23	3	0	7	1	0	70
Clouds	39	3	6	1	12	5	3	0	0	69
Pearl	0	1	0	0	4	30	3	0	29	67
Match	2	1	12	1	9	0	1	5	3	34
Gasoline	1	0	7	11	2	0	1	0	3	25
Total	213	164	108	77	68	57	48	40	35	810

used with each word from one to nine times.

"Movement," "beauty," "power," and "heat," the animistic reasons of the learning tasks, accounted for 47 per cent of the reasons given by Ss in all 27 conditions. In order to determine whether learning life responses to animistic reasons and/or acquiring reasons responses to test words influenced frequencies with which these reasons were offered, percentages of their use as animistic reasons were determined for: (a) the three groups which learned both life responses to reasons and reasons responses to test words, (b) the six groups which acquired reasons responses to test words, (c) the six groups which learned life responses to reasons, and (d) the remaining 12 groups. The percentages of animistic reasons in M, B, P, and H categories combined for these sets of groups were 67.0, 52.0, 44.6, and 41.5 respectively. The X^2 for the frequencies on which these percentages were based was 23.27 which is significant at beyond the .01 level with three df. Thus, groups which had used the reasons words in both learning tasks cited them most frequently, Ss who had learned to associate them with test words used them next most frequently, and these reasons were least common among groups which had had no preanimistic test experience with them.

Reasons for nonanimistic responses.--Frequencies of reasons for nonanimistic responses for each word separately and combined and for instruction conditions both separately

and combined are shown in Tables 22 and 23. "Chemical composition" and "reproduction" accounted for 28 and 15 per cent of nonanimistic responses, respectively. They occurred with almost equal frequencies to each word within scientist, regular, and poet instructions. However, these frequencies were somewhat lower for poet instructions. The Unc, InO, Metab, NPA, Mov, and Proto categories were used consistently but with lower frequencies under scientist and regular instructions. However, given poet instructions, Ss virtually abandoned these categories with the exception of unclassified reasons and the movement category for pearl, match, and gasoline. "Artificial" was cited almost exclusively for pearl, match, and gasoline.

When categories were ranked in terms of frequency of use under the three instruction conditions, rank-order coefficients of +.78, +.02, and -.02 were obtained for scientist-regular, scientist-poet, and poet-regular pairs, respectively. Thus, poet instructions brought about marked shifts in relative frequencies of use of nonanimistic categories.

The three groups which had learned "life" responses to scientific criteria as well as criteria responses to test words, cited nonreproductive, nonirritable, noncontractile, or nonmetabolic 33.8 per cent of the time as reasons for nonanimistic responses. The percentages for the six groups which had learned life responses to reproductive,

Table 22

Frequencies of Reasons for Nonanimistic Responses to Each Word Separately and Combined for Each of the Instruction Conditions

Instructions	Reasons	Words										
		Sea	Earth	Sun	Stars	Wind	Lightning	Clouds	Pearl	Match	Gasoline	Total
Scientist (Sci)	CC	20	17	22	22	27	27	34	20	21	19	229
	Rep	10	14	13	12	13	13	13	12	14	15	129
	Unc	2	3	1	4	3	2	2	3	2	4	26
	InO	8	8	8	7	5	5	7	8	7	9	72
	Metab	5	3	5	7	3	3	5	6	3	6	46
	NPA	2	2	3	3	4	3	3	2	2	2	26
	Artif	0	0	0	0	0	1	0	3	16	13	33
	Irr	1	0	5	1	3	3	1	4	2	2	22
	Mov	2	3	2	3	1	1	2	4	4	3	25
	Proto	4	2	4	4	4	5	4	3	3	2	35
	NF	0	0	0	1	1	1	1	2	1	2	9
	InA	0	0	1	0	1	1	1	0	1	1	6
	Sup	0	0	0	1	4	1	1	1	1	1	10
	Dur	0	0	0	0	1	6	1	0	1	1	10
	Growth	1	2	1	1	0	0	1	3	2	1	12
	NMa	0	0	0	0	9	2	5	0	0	1	17
	Fun	0	0	1	3	2	2	1	3	3	0	15
	Cont	1	0	0	0	2	2	3	0	0	1	9
	NDy	0	1	0	1	0	1	2	2	1	1	9
	Total	56	55	66	70	83	79	87	76	84	84	740

Table 22 continued

Instructions	Reasons	Words										Total
		Sea	Earth	Sun	Stars	Wind	Lightning	Clouds	Pearl	Match	Gasoline	
Regular (R)	CC	19	12	23	18	24	25	25	24	18	19	207
	Rep	18	16	15	16	14	16	15	15	19	15	159
	Unc	1	4	4	7	5	4	4	3	2	3	37
	InO	4	6	4	5	4	3	4	2	6	4	42
	Metab	5	5	5	8	6	4	5	5	5	8	56
	NPA	4	4	6	5	5	7	5	4	6	6	52
	Artif	0	0	0	0	0	0	0	1	10	9	20
	Irr	4	4	8	5	5	4	5	9	4	5	53
	Mov	1	1	0	2	1	0	1	3	3	3	15
	Proto	3	3	3	3	3	4	3	4	3	3	32
	NF	0	0	1	0	0	0	0	1	0	2	4
	InA	1	2	2	2	2	2	2	1	3	3	20
	Sup	0	0	0	0	1	1	0	1	2	2	7
	Dur	0	0	1	2	1	5	3	0	3	2	17
	Growth	3	5	3	3	1	1	1	3	1	2	23
	NMa	0	0	0	0	3	0	1	0	0	0	4
	Fun	0	0	0	1	1	1	2	3	1	2	11
	Cont	0	0	0	0	3	3	3	0	0	0	9
	NDy	0	0	1	1	0	0	0	1	1	0	4
	Total	63	62	76	78	79	80	79	80	87	88	772

Table 22 continued

Instructions	Reasons	Words										Total
		Sea	Earth	Sun	Stars	Wind	Lightning	Clouds	Pearl	Match	Gasoline	
Poet (F)	CC	4	9	9	5	6	12	12	11	10	17	95
	Rep	2	2	1	0	2	0	1	0	2	2	12
	Unc	3	6	3	9	4	5	3	7	7	11	58
	InO	0	0	0	0	0	0	0	0	0	0	0
	Metab	0	0	1	1	0	0	0	0	1	1	4
	NPA	0	1	1	1	0	1	1	1	1	1	8
	Artif	0	0	0	0	0	1	0	3	14	14	32
	Irr	0	0	1	0	0	1	1	1	0	0	4
	Mov	0	1	2	5	0	0	1	10	7	9	35
	Proto	0	0	1	0	0	1	1	0	1	0	4
	NF	0	2	1	4	2	5	4	5	9	11	43
	InA	1	2	1	2	1	2	1	4	3	3	20
	Sup	2	2	2	2	4	5	4	2	1	1	25
	Dur	0	0	0	1	0	5	1	0	7	1	15
	Growth	0	0	1	1	0	0	0	1	0	0	3
	NMa	0	0	0	0	3	1	4	0	0	0	8
	Fun	0	0	0	0	0	1	0	1	0	1	3
	Cont	0	0	0	0	1	1	1	0	0	0	3
	NDy	0	0	0	2	0	0	0	1	2	1	6
	Total	12	25	24	33	23	41	35	47	65	73	378

Table 23

Frequencies of Reasons for Nonanimistic Responses to Each Word Separately and Combined

Objects	Reasons																			Total
	CC	Rep	Unc	InO	Met	NPA	Art	Irr	Mov	Pro	NF	InA	Sup	Dur	Gr	NMa	Fu	Con	NDy	
Sea	43	30	6	12	10	6	0	5	3	7	0	2	2	0	4	0	0	1	0	131
Earth	33	32	13	14	8	7	0	4	5	5	2	4	2	0	7	0	0	0	1	142
Sun	54	29	8	12	11	10	0	14	4	8	2	4	2	1	5	0	1	0	1	166
Stars	45	28	20	12	16	9	0	6	10	7	5	4	3	3	5	0	4	0	4	181
Wind	57	29	12	9	9	9	0	8	2	7	3	4	9	2	1	15	3	6	0	185
Lightning	64	29	11	8	7	11	2	8	1	10	6	5	7	16	1	3	4	6	1	200
Clouds	71	29	9	11	10	9	0	7	4	8	5	4	5	5	2	10	3	7	2	201
Pearl	55	27	13	10	11	7	7	14	17	7	8	5	4	0	7	0	7	0	4	203
Match	49	35	11	13	9	9	40	6	14	7	10	7	4	11	3	0	4	0	4	236
Gasoline	55	32	18	13	15	9	36	7	15	5	15	7	4	4	3	1	3	1	2	245
Total	531	300	121	114	106	86	85	79	75	71	56	46	42	42	38	29	29	21	19	1890

contractile, irritable, and metabolic offered the negations of these criteria as reasons for only 17.7 per cent of their nonanimistic responses. The percentage for Ss who had associated scientific criteria with test words was 33.1. Among the 12 remaining groups, 26.7 per cent of the reasons were the scientific criteria.

The χ^2 of 31.75 for the frequencies on which these percentages were based is significant at beyond the .01 level. Thus, there was some carry-over of these learning experiences to the animistic test. If Ss had learned scientific criteria responses to test words with or without prior acquisition of "life" responses, they used those criteria proportionately more often than Ss who had not had prior experiences with those criteria. On the other hand, use of reproduction, contractile, irritable, and metabolic decreased the likelihood that Ss would cite their negations as reasons for nonanimistic responses.

Questionnaire

Table 24 lists traits which Ss used to characterize poets or scientists along with frequencies with which each trait was considered applicable to one or the other type of individual. The most even "split" was 174 or 64.4 per cent for scientists and 35.6 per cent for poets for "examine nature." Only one S thought that scientists could be considered to "seek beauty." This trait and "emotional," "love beauty," "illogical," "uninquiring," and "love nature" were

Table 24

Frequencies with which all Ss Considered Each Trait Applicable to Poets or Scientists

Trait	Characterizes	
	Poets	Scientists
Idealistic	229	41
Easily discouraged	235	35
Seek knowledge	11	259
Unimaginative	38	232
Insensitive to people	29	241
Emotional	265	5
Ignore beauty	3	267
Don't understand people	44	226
Unemotional	3	267
Illogical	259	11
Imaginative	233	37
Persistent	18	252
Love beauty	263	7
Love nature	248	22
Understand people	222	48
Inquisitive	15	255
Logical	5	265
Sensitive to people	236	34
Uninquiring	257	13
Seek beauty	269	1
Realistic	15	255
Examine nature	96	174

checked as characteristic of poets by at least 90 per cent or more of the Ss. Comparable percentages agreed that "unemotional," "ignore beauty," "logical," "seek knowledge," "inquisitive," "realistic," and "persistent" should be applied to scientists. Thus, Ss assigned different traits to poets than to scientists.

Table 25 summarizes frequencies with which Ss indicated that poets or scientists would use each of the four words or phrases which accompanied each of the 10 words of the animistic test. At least 260 of the 270 Ss agreed that a particular word or phrase would be used by scientists or poets for all but the phrase "distant suns." Fifty-six thought poets would use this phrase to describe stars while 214 thought it would be the choice of scientists. Apparently, therefore, Ss thought that poets and scientists would differ markedly in the ways each would talk about or describe objects to which test words referred.

Table 25

Frequencies with which all Ss indicated Poets or Scientists would use Each Word or Phrase Subsumed under the 10 Words of the Animistic Test

Words and Phrases	Poet Would Use	Scientist Would Use
Sun		
burning mass of gases	1	269
source of heat and light	4	266
powerful and merciless	269	1
father of all things	270	0
Clouds		
visible mass of water particles	0	270
body of water and dust particles	2	268
lonely wanderers	270	0
white sheep in a pasture	270	0
Sea		
restless and relentless	270	0
covers 2/3 of earth's surface	0	270
intercontinental basin of water	1	269
fickle friend	270	0
Lightning		
angry	269	1
electrostatic phenomenon	0	270
fury of the Gods	270	0
electrical discharge	0	270
Wind		
current of air	0	270
enemy of peace and quiet	270	0
whispering words of nature	270	0
moving air	4	266
Stars		
distant suns	56	214
luminous masses of gases	1	269
glow-worms of the universe	268	2
watchful, propheaying bodies	270	0

Table 25 continued

Words and Phrases	Poet Would Use	Scientist Would Use
Earth		
provider of life	260	10
rotating planet	0	270
spherical body in solar system	0	270
mother of men	270	0
Match		
ignites by friction	0	270
power and warmth	265	5
wood tipped with combustibles	1	269
lonely	270	0
Pearl		
translucent organic compound	0	270
dazzling beauty	270	0
protective secretion	0	270
chaste	270	0
Gasoline		
marvellous worker	268	2
liquid hydrocarbon	0	270
life-blood of car	266	4
combustible liquid	1	269

Discussion

Associative learning

There were no differences in rates of learning or fifth-trial levels of achievement among groups which had acquired life responses to either scientific criteria or animistic reasons stimuli. Reasons responses to test words were acquired more rapidly and were at higher levels of mastery on the tenth trial than scientific criteria responses. However, number of correct criteria or reasons responses over the 10 trials were not correlated with animistic test scores.

The relatively greater mastery of animistic reasons than of scientific criteria probably reflects the assignment of reasons to words in part on the basis of Ss use of those reasons to explain their animistic responses. In addition, animistic reasons might have been more meaningful and/or familiar than the scientific criteria.

Animistic responses

The occurrence of one or more animistic responses in the animistic tests of 63 per cent of the Ss is consistent with Simmons and Goss' (1957) previous finding of 64 per cent. Not only did 20 per cent or more of the Ss in all treatment combinations give at least one animistic response, but also, under poet instructions, all Ss of five groups checked "yes" to three or more test words. Thus, whatever the specific determinants of the animistic responses, these

results along with those of other investigators (Bell, 1954; Crannell, 1954; Crowell & Dole, 1957; Dennis, 1953, 1957; Lowrie, 1954; Voeks, 1954) leave little doubt that many college students do not always correctly apply the concepts of "living" and "nonliving" to test words, and presumably to the objects to which these words refer.

Poet instructions increased animistic responses in all groups so instructed relative to regular and scientific instruction groups which had had the same sequences of pretest associative learning experiences. Moreover, poet instructions increased animistic responses to every test word. Since these increases are comparable in magnitude to those obtained previously (Simmons & Goss, 1957), such instructions can be used with confidence, henceforth, to assure high levels of animistic responding.

Several factors may account for the failure to obtain main or interaction effects from the learning tasks either alone or in combination. One factor is lack of transfer from learning situations to the test situation. For the animistic test, Ss were not told to use those responses they had learned and also they were given different instructions, both of which may have decreased the similarity of test to learning conditions. In the case of life responses to criteria or reasons stimuli, these stimuli first occurred visually and one-by-one. In the animistic test they had to occur first as oral or written responses, often in

competition with other responses, and when written, they were usually in contexts of other words. Life responses were elicited regularly and "out loud" during learning in contrast to their covert and probably less regular occurrence during the test.

Although the 10 word stimuli appeared in both criteria-reasons lists and the animistic test, the random orders in which they appeared for learning differed from their test order. Also, the context in which they occurred during the test was different. Such changes have produced decrements in recall (McGeoch & Irion, 1952; Reed, 1931). Criteria or reasons responses were spoken during their acquisition and elicited regularly. During the animistic test they were written, a change which also occasions decrements in amounts retained (McGeoch & Irion, 1952). Thus, these several bases of dissimilarity of stimuli and responses of learning may have precluded transfer of strong associations to reasons or criteria stimuli. That some transfer took place, however, is indicated by the analysis of reasons for animistic and nonanimistic responses. Groups which had had animistic reason-life responses and test words-animistic reasons tasks used those reasons responses more frequently than groups which had one or the other task. In turn, these groups made greater use of those reasons than groups which had neither task. Also, these reasons were given more frequently by groups which had acquired test-words-reasons associations

than by those which learned life responses to those reasons. The stimulus and response conditions of the former are probably more similar to test conditions than those of the latter.

Scientific criteria were offered as reasons for animistic responses more frequently by groups which had learned to associate those criteria to test words or who learned this task plus responses to reproduction, irritable, contractile, and metabolic. Groups which had no experience with either list used scientific criteria more frequently than groups which had learned life responses to reproduction, irritable, contractile, and metabolic. These words are, of course, the opposite of scientific criteria for nonanimistic responses. Apparently, Ss experiences with them as stimuli reduced frequencies of use of their negations as reasons for nonanimistic responses.

Although transfer of criteria or reasons responses did occur, degree of transfer might not have been sufficient to effect animistic responses. Or, the requisite consequent evocation of life responses might not have occurred. This might be particularly the case for S-Sc-P, S-Sc-R, and S-Sc-Sci groups for whom nonreproductive, noncontractile, nonirritable, and nonmetabolic had to be followed by reproduction, contractile, irritable, and metabolic if life responses were to be elicited.

Although less likely, degree of mastery of the learning

tasks might have been insufficient to assure the postulated chain of events for words to criteria or reasons to life responses to checking "yes" or "no." Or, the postulated chain may have been fairly well established within the task of acquiring criteria or reasons responses to test words but still not in sufficient strength to overcome the effects of the various conditions which might have made the learning situations and animistic test dissimilar.

Another explanation might be that the type of learning procedure was inadequate to assure discrimination between words referring to living and those referring to nonliving objects. Both types of words may have to be included in lists of words to which scientific criteria and/or animistic reasons responses are learned and perhaps, in the animistic test as well.

Since one or more of these factors may have accounted for the lack of influence of the learning tasks, it seems premature to draw any conclusions regarding the validity of the (a) and (h) functions of the proposed stimulus-response analysis of the determinants of responses to animistic test words. Certainly, however, the present results are not encouraging. Either the analysis is incorrect or, with respect to present knowledge, more sophisticated and intensive efforts will be necessary to assure realization of the proper conditions for adequate tests of the analysis.

Reasons

In agreement with previous findings, "movement" and "contains life" were the most frequently given reasons for animistic responses. Rank-orders of the frequencies with which other reasons were used as well as frequencies of animistic responses to test words were essentially the same.

Presumably these reasons occur as responses to both living and nonliving things. Therefore, inappropriate response-mediated generalization of the "living" response is probably in large part responsible for Ss' animistic responses to test words. And, analysis of Ss' conceptions of how scientists and poets would respond to the test words suggests that poet instructions might have increased the use of mediating terms which would be likely to elicit responses of "living."

Sea and earth were considered living most frequently while match and gasoline elicited "yes" responses least frequently. Not only does it seem probable that most Ss had previously acquired more and stronger reasons responses to sea and earth than to match and gasoline, but also the former have probably occurred much more often in contexts in which living things were mentioned.

The most frequently cited reasons for nonanimistic responses were "chemical composition" and "reproduction." For the most part, the former consisted of quasi-scientific definitions. The latter was scored conservatively; that is,

a response was so classified only if explicit mention of reproduction had been made. "Chemical composition" reasons may be attributed to transfer from pre-experimental exposure to the materials of science courses. However, these definitions tended to be used indiscriminately or regardless of degree of appropriateness. "Reproduction" was one of the scientific criteria used in learning. As was noted above, learning experiences with scientific criteria were related to their occurrence as reasons. Of those criteria it seems probable that most Ss had greater pre-experimental familiarity with reproduction than with any of the other three as characteristic of living and inapplicable to nonliving things. If so, Ss' citation of this reason more frequently than the other three is consistent with general associative principles.

Questionnaire

The findings of both parts of the questionnaire indicated that Ss clearly distinguished between scientists and poets. In general, those traits which they held to be characteristic of scientists were not attributed to poets and similarly for attributes assigned to poets. More specifically, poets were considered emotional, to love and seek beauty, to be uninquiring and illogical. Logical, inquisitive, ignore beauty, and persistent were the phrases most consistently assigned to scientists.

Furthermore, when asked to check words or phrases with

which poets or scientists would describe objects referred to by words of the animistic test, Ss were almost unanimous in ascribing each word or phrase to either scientists or poets. The only exception among the 40 words or phrases was "distant suns" as a description of "stars" and only 56 of 270 thought that poets rather than scientists would use this description. Thus, Ss thought that poets and scientists should be described with different traits and, more importantly, they differentiated between the two types with respect to the sets of responses they might make to the test words. Although the presence of such dissimilar responses was not directly observed during the animistic test, these findings lend support to the (e) condition or function of the model which assumes that poet and scientist instructions arouse different sets of responses and resultant stimuli.

Summary

Animistic thinking has been demonstrated in Ss of diverse backgrounds and various age groups by means of several response-eliciting procedures. Thus, the occurrence of such thinking is a well-founded descriptive fact. The study reported here attempted to specify some of the potentially more relevant determinants of animistic thinking in more precise fashion. The theoretical framework was a stimulus-response paradigm within which animistic responses to test words were attributed to generalization and discrimination based on mediating stimuli and responses.

In order to assess this paradigm and also to replicate previous findings, animistic responses were investigated as a function of: (a) experimental strengthening of associations between scientific criteria or animistic reasons stimuli and life responses, (b) acquisition of scientific criteria or animistic reasons to test word stimuli, and (c) regular instructions for the animistic test alone as well as such instructions supplemented by directions to respond like scientists or poets. Including controls there were 27 treatment combinations with 10 Ss in each. Five and 10 paired-associates learning trials were administered for the (a) and (b) tasks respectively, after which Ss were introduced to the animistic test with regular, poet, or scientist instructions. A questionnaire was then given to determine Ss'

patterns of assignment of various traits to poets and scientists, and their conceptions of responses which scientists or poets would make to test words.

Frequencies of animistic responses to all 10 test words were increased by poet instructions. Acquisition of life responses to scientific criteria or animistic reasons and/or of criteria or reasons responses to test words had no main or interaction effects. "Movement" and "contains life" were the most frequently given reasons for animistic responses while the most frequently cited reasons for nonanimistic responses were "chemical composition" and "reproduction."

Questionnaire answers revealed that Ss attribute different traits to scientists and poets. Also, they thought that these types of individuals would select different sets of phrases to describe objects to which the test words referred.

The failure of the learning tasks to influence animistic responses was viewed as possibly due to lack of transfer of such learning to the animistic test situation, insufficient mastery of the tasks, or use of a learning procedure which did not assure experience in discriminative application of concepts of living and nonliving. Therefore, conditions for a satisfactory test of the stimulus-response analysis may not have been achieved. However, the questionnaire results provided support for the assumption of a different set of responses to poet than to scientist instructions.

References

Abel, T. M. Unsynthetic modes of thinking among adults: A discussion of Piaget's concepts. Amer. J. Psychol., 1932, 44, 123-132.

Anthony, C. P. Textbook of anatomy and physiology. (2nd ed.) St. Louis: C. V. Mosley Co., 1946.

Bell, C. R. Additional data on animistic thinking. The Sci. Mon., 1954, 79, 67-69.

Bruce, M. Animism vs evolution of the concept alive. J. Psychol., 1941, 12, 81-90.

Carlson, A. J. & Johnson, V. The machinery of the body. (4th ed.) Chicago: Univer. of Chicago Press, 1953.

Cochran, W. G. A comparison of percentages in matched samples. Biometrika, 1950, 37, 256-266.

Crannell, C. W. The responses of college students to a questionnaire on animistic thinking. The Sci. Mon., 1954, 78, 54-56.

Crowell, D. H. & Dole, A. A. Animism and college students. J. educ. Res., 1957, 50, 391-395.

Dennis, W. Historical notes on child animism. Psychol. Rev., 1938, 45, 257-266.

Dennis, W. Piaget's questions applied to a child of known environment. J. genet. Psychol., 1942, 60, 307-320.

Dennis, W. Animism and related tendencies in Hopi children. J. abnorm. soc. Psychol., 1943, 38, 21-36.

Dennis, W. Animistic thinking among college and university students. The Sci. Mon., 1953, 76, 247-249.

Dennis, W. Animistic thinking among college and high school students in the Near East. J. educ. Psychol., 1957, 48, 193-198.

Dennis, W. & Mallinger, B. Animism and related tendencies in senescence. J. Gerontol., 1949, 4, 218-222.

Dennis, W. & Russell, R. W. Piaget's questions applied to Zuni children. Child Develop., 1940, 11, 181-187.

Deutsche, J. M. The development of children's concepts of causal relations. Univer. Minn. Inst. Child Welf. Monogr., 1937.

Fenn, J. D. & Goss, A. E. The role of mediating verbal responses in the conceptual sorting behavior of normals and paranoid schizophrenics. J. genet. Psychol., 1957, 90, 59-67.

Guilford, J. P. Fundamental statistics in psychology and education. (2nd ed.) New York: McGraw-Hill Book Co. Inc., 1950.

Hazlitt, V. Children's thinking. Brit. J. Psychol., 1930, 20, 354-361.

Huang, I. Children's conceptions of physical causality: A critical summary. J. genet. Psychol., 1943, 63, 71-121.

Huang, I. & Lee, H. W. Experimental analysis of child animism. J. genet. Psychol., 1945, 66, 69-74.

Johnson, D. M. The psychology of thought and judgment. New York: Harper, 1955.

Johnson, E. C. & Josey, C. C. A note on the development of the thought forms of children as described by Piaget. J. abnorm. soc. Psychol., 1931-2, 26, 338-339.

Klinberg, G. The distinction between living and not living among 7-10 year old children, with some remarks concerning the so-called animism controversy. J. genet. Psychol., 1957, 90, 227-238.

Kotula, L. J. The development of concepts concerning animate and inanimate objects. Unpublished M.S. thesis, Univer. of Pittsburgh, 1949.

Lindquist, E. F. Design and analysis of experiments in psychology and education. Boston: Houghton Mifflin Co., 1953.

Lowrie, D. C. Letter to Editor. The Sci. Mon., 1954, 79, 69-70.

McGeoch, J. A. & Irion, A. L. The psychology of human learning. (2nd ed.) New York: Longmans, Green and Co., 1952.

Mead, M. An investigation of the thought of primitive children with special reference to animism. J. Roy. Anthrop. Instit., Gr. Britain and Ireland, 1932, 62, 173-190.

Oakes, M. E. Children's explanations of natural phenomena. Teach. Coll. Contr. Educ., 1947, N. 926, vi, 151 p.

Osgood, C. E. Method and theory in experimental psychology. New York: Oxford Univer. Press, 1953.

Piaget, J. The language and thought of the child. New York: Harcourt-Brace, 1926.

Piaget, J. Judgment and reasoning in the child. New York: Harcourt-Brace, 1928.

Piaget, J. The child's conception of the world. New York: Harcourt-Brace, 1929.

Piaget, J. The child's conception of physical causality. New York: Harcourt-Brace, 1930.

Piaget, J. Children's philosophies. In Murchison, C. (Ed.), Handbook of child psychology. (2nd ed. rev.) Worcester: Clark Univer. Press, 1933.

Reed, H. J. The influence of a change of conditions upon the amount recalled. J. exp. Psychol., 1931, 14, 632-649.

Russell, R. W. Studies in animism: II. The development of animism. J. genet. Psychol., 1940, 56, 353-366. (a)

Russell, R. W. Studies in animism: IV. An investigation of concepts allied to animism. J. genet. Psychol., 1940, 57, 83-91. (b)

Russell, R. W. Studies in animism: V. Animism in older children. J. genet. Psychol., 1942, 60, 329-335.

Russell, R. W. & Dennis, W. Studies in animism: I. A standardized procedure for the investigation of animism. J. genet. Psychol., 1939, 55, 389-400.

Russell, R. W., Dennis, W. & Ash, F. E. Studies in animism: III. Animism in feeble-minded subjects. J. genet. Psychol., 1940, 57, 57-63.

Saltz, E. & Myers, T. A method for group presentation of paired associates learning materials. Paper read at Midwest. Psychol. Ass., Chicago, 1955.

Simmons, A. J. & Goss, A. F. Animistic responses as a function of sentence contexts and instructions. J. genet. Psychol., 1957, 91, 181-189.

Stackpole, C. E. & Leavell, L. C. Textbook of physiology. New York: The Macmillan Co., 1953.

Strauss, A. L. The animism controversy: Re-examination of Huang-Lee data. J. genet. Psychol., 1951, 78, 105-113.

Vinacke, W. P. The psychology of thinking. New York: McGraw-Hill, 1952.

Voeks, V. Sources of apparent animism in students. The Sci. Mon., 1954, 79, 406-407.

Appendix

Animistic Test

Name: _____ Date: _____

OBJECTS	RESPONSE		REASONS
	Yes	No	
1. Sun			
2. Clouds			
3. Sea			
4. Lightning			
5. Wind			
6. Stars			
7. Earth			
8. Match			
9. Pearl			
10. Gasoline			

Instructions for the Animistic Test

Now we are going to try something different. First of all, fill in the information called for (i.e., name and date) at the top of the sheet of paper I have just handed to you. In particular, don't forget your name.

Now, look at the list of words running down the left hand side of the page. These words refer to a number of different objects. I want you to indicate whether you think the object referred to by each of these words is "living" or "not living." If you think the object referred to is "living" put a check in the Yes column opposite that word. If you think the object referred to is "not living" place a check in the No column opposite the word. CHECK EVERY WORD.

After you have placed a check in either the Yes or No column, give the reason or reasons why you checked Yes or No for the object referred to by that word.

In deciding whether the object is "living" or "not living," I want you to respond or decide:

1) as if you were a scientist --- e.g., Einstein, Newton, Madam Curie, or Pasteur

2) as if you were a poet --- e.g., Shakespeare, Frost, Longfellow, or Homer

Are there any questions?

All right, go ahead.

1a) like a scientist would

2a) like a poet would

Questionnaire

A. Listed below are a number of traits or behavior patterns some of which might characterize poets and scientists. First go down the left-hand column of blank spaces and check (✓) those traits which you think are typical or most characteristic of POETS. Then go down the right-hand column and check (✓) the traits which you think are typical or most characteristic of SCIENTISTS.

characterizes POETS	TRAIT	characterizes SCIENTISTS
_____	Idealistic	_____
_____	Easily discouraged	_____
_____	Seek knowledge	_____
_____	Unimaginative	_____
_____	Insensitive to people	_____
_____	Emotional	_____
_____	Ignore beauty	_____
_____	Don't understand people	_____
_____	Unemotional	_____
_____	Illogical	_____
_____	Imaginative	_____
_____	Persistent	_____
_____	Love beauty	_____
_____	Love nature	_____
_____	Understand people	_____
_____	Inquisitive	_____
_____	Logical	_____
_____	Sensitive to people	_____
_____	Uninquiring	_____
_____	Seek beauty	_____
_____	Realistic	_____
_____	Examine nature	_____

Questionnaire Continued

B. The words of the list which you have just indicated as referring to objects or events which are living or non-living are listed here again. Under each of these words are four words or phrases which people typically use to describe or characterize the objects to which the words refer.

FIRST, go down the left-hand column of blank spaces and check (✓) each of the words or phrases which you think a POET would be most likely to use in describing or characterizing the object or event. THEN, go down the right-hand column of blank spaces and check (✓) each of the words or phrases which you think a SCIENTIST would be most likely to use in describing or characterizing the object or event.

POET would use		SCIENTIST would use
	SUN	
____	burning mass of gases	____
____	source of heat and light	____
____	powerful and merciless	____
____	father of all things	____
	CLOUDS	
____	visible mass of water particles	____
____	body of water and dust particles	____
____	lonely wanderers	____
____	white sheep in a pasture	____
	SEA	
____	restless and relentless	____
____	covers 2/3 of earth's surface	____
____	intercontinental basin of water	____
____	fickle friend	____

Questionnaire Continued

POET would use		SCIENTIST would use
	LIGHTNING	
____	angry	____
____	electrostatic phenomenon	____
____	fury of the Gods	____
____	electrical discharge	____
	WIND	
____	current of air	____
____	enemy of peace and quiet	____
____	whispering words of nature	____
____	moving air	____
	STARS	
____	distant suns	____
____	luminous masses of gases	____
____	glow-worms of the universe	____
____	watchful, prophesying bodies	____
	EARTH	
____	provider of life	____
____	rotating planet	____
____	spherical body in solar system	____
____	mother of men	____
	MATCH	
____	ignites by friction	____
____	power and warmth	____
____	wood tipped with combustibles	____
____	lonely	____

Questionnaire Continued

POET would use		SCIENTIST would use
	PEARL	
_____	translucent organic compound	_____
_____	dazzling beauty	_____
_____	protective secretion	_____
_____	chaste	_____
	GASOLINE	
_____	marvellous worker	_____
_____	liquid hydrocarbon	_____
_____	life-blood of car	_____
_____	combustible liquid	_____

Preliminary Questionnaire

We are interested in what people think about people who make contributions in different areas. Two of these areas are science and poetry. Please answer the questions below as well as you can.

A. First of all POETS:

1. Would you please list the five (5) men or women you consider to be the greatest poets of all time of any country or language.

2. Now, would you please list as many traits or attributes which you think best describe or characterize poets.

B. Now, SCIENTISTS:

1. Would you please list the five (5) men or women you consider to be the greatest scientists of all time of any country or language.

2. Now, would you please list as many traits or attributes which you think best describe or characterize scientists.

Preliminary Questionnaire Continued

Listed below are 10 words which refer to different natural objects or happenings. Now, think of POETS. Write after each of these words as many other words or phrases as you can which you think poets in general or, perhaps such poets as Shakespeare, Wordsworth, or Frost, would use in describing or characterizing the objects or happenings to which these words refer.

SEA	
EARTH	
SUN	
STARS	
PEARL	
WIND	
LIGHTNING	
CLOUDS	
MATCH	
GASOLINE	

Preliminary Questionnaire Continued

Listed below are 10 words which refer to different natural objects or happenings. Now, think of SCIENTISTS. Write after each of these words as many other words or phrases as you can which you think scientists in general or, perhaps such scientists as Newton, Einstein, Madam Curie, or Darwin, would use in describing or characterizing the objects or happenings to which these words refer.

SEA	
EARTH	
SUN	
STARS	
PEARL	
WIND	
LIGHTNING	
CLOUDS	
MATCH	
GASOLINE	

Instructions for associative learning tasks

PLEASE DO NOT TOUCH THE MATERIALS IN FRONT OF YOU

This is an experiment in learning complex verbal material and not a psychological test. Therefore, we are not interested in your reactions as an individual but as a member of a group.

The card before you has a learning side and a test side. The four booklets numbered I, II, III, IV are to be used for learning. The test booklet is on the other side. Make no marks on the learning booklets. You will write your answers in the test booklet.

You will work with only one of the four learning booklets on a given trial. I'll tell you which one at the beginning of each trial. Do not turn the numbered first page of these booklets until I tell you to do so. When I tell you to turn the numbered page you will find that on the next page and on every page which follows there are two (2) words or phrases which together make a pair. You will have four (4) seconds to study and learn the pair of words on the second page. At the end of the four (4) seconds I will simply say "turn" which is the signal for you to turn to the next page on which another pair will appear. You will also have four (4) seconds to study this pair as well as each subsequent pair.

Instructions Continued

After you have studied the last pair of words or phrases in the learning booklet you are using you will be told to close that booklet. Then I will tell you to turn the card over and start to fill in the first answer sheet of the test booklet. On this answer sheet you will find only the first word or phrase of each of the pairs of the learning booklet you have just studied. Next to each of these words or phrases on the one page, you will write the second word or phrase of each of the pairs in the learning booklet.

For example: On the first page of a learning booklet you might find DESK MADE OF WOOD. Your task will be to learn these words so well that when DESK appears alone in the test booklet, you will be able to write MADE OF WOOD next to it. On the second page of the same learning booklet you might find CHAIR UPHOLSTERY and you will be expected to write UPHOLSTERY next to CHAIR when it appears in the test booklet underneath DESK. You will follow this same procedure with each of the other pairs.

If you do not know the paired word or phrase, guess since this will not hurt your score. Because we are interested only in your first response, even though you may want to change your answer, do not erase or cross out the answer you wrote. Erasures or crossings out will not be scored.

The two (2) words or phrases which make up each pair

will always appear together. However, the pairs appear in different orders in each of the learning booklets. Your task will be to learn each pair so well that when you see only the first word or phrase of the pair in the test booklet, you will be able to write the correct second word or phrase.

You will be given 16 seconds to write your answers on each test sheet. At the end of the 16 seconds I will simply say "stop." This will be the signal for you to turn the card over, back to the learning side immediately, and at the same time to tear out the answer sheet you have just used. Do it like this. Then write your name on each torn out page of the test booklet, after which you will pass this torn out answer sheet in to your left where the examiner will collect it. Be sure your name is on each torn out page of the test booklet before you pass it in. This same procedure will be followed after each trial.

Remember, follow the instructions of the examiner and turn the page exactly when told. You will have ample time to learn each of the pairs.

Are there any questions?

Instructions Continued

Now you will be given another series of words or phrases different from those you have had already but involving the same procedure.

Again, as before, on every page of each of the learning booklets there will be two (2) words or phrases which together make a pair. This is still an experiment in learning complex verbal material. Your task, therefore, will be to learn each of the pairs so well that when only one word or phrase of each of the pairs appears in the test booklet you will be able to write the correct second word or phrase. You will be given four (4) seconds to learn each of the pairs and 40 seconds to write your answers in the appropriate sheet of the test booklet.

Remember, follow the instructions carefully and be sure to promptly obey the signals and directions of the examiner and turn the page or booklet when told.

Scores on Animistic Test for each S of each Group

Test words-criteria reasons associations		Criteria reasons-life responses associations								
		S			A			C		
Instructions	Subjects	Sc	An	Co	Sc	An	Co	Sc	An	Co
Scientist (Sci)	1	0	2	1	0	3	0	2	2	0
	2	6	2	0	4	0	3	2	0	0
	3	2	3	0	3	0	5	0	10	0
	4	0	1	0	0	0	0	1	7	4
	5	2	4	0	0	7	0	3	5	2
	6	0	0	0	2	0	0	0	5	5
	7	0	5	3	0	0	0	5	2	4
	8	3	0	2	4	8	0	1	0	0
	9	4	5	4	0	0	4	1	3	0
	10	0	0	1	0	0	0	0	0	3
Regular (R)	1	0	0	2	0	3	5	0	0	0
	2	3	2	3	0	0	1	0	2	0
	3	0	0	1	0	0	0	2	2	6
	4	6	0	2	2	8	0	0	0	0
	5	1	0	0	7	1	0	8	0	8
	6	0	0	0	2	2	0	0	1	6
	7	0	0	0	0	7	2	1	7	1
	8	0	0	5	0	0	0	3	1	0
	9	0	0	0	1	0	0	2	0	0
	10	2	1	0	2	7	0	0	0	0
Poet (P)	1	3	6	4	3	7	8	7	6	8
	2	4	7	8	8	5	6	0	0	8
	3	6	6	8	9	6	8	9	7	3
	4	5	9	6	8	9	6	5	4	4
	5	6	5	10	7	3	8	4	3	4
	6	10	7	9	8	10	5	8	7	8
	7	4	6	0	0	6	5	7	4	8
	8	7	6	7	3	5	7	7	6	7
	9	6	6	0	2	4	8	4	3	9
	10	7	5	8	7	5	5	7	0	3

Acknowledgments

The writer would like to express his appreciation to Dr. Glenn F. Fennell, Dr. Vernon P. Helming, Dr. Solis L. Kates, Dr. John Manfredi, and Dr. Claude C. Neet for their valuable suggestions, and to Miss Saundra Lisk and Mr. Fred Schwartz, fellow graduate students who aided in the assembly, administration and scoring of experimental materials.

Gratitude also goes to those students who so generously gave of their time to serve as subjects in this research.

My greatest indebtedness is to the chairman of the thesis committee, Dr. Albert E. Goss who served throughout the completion of this investigation as a constant source of inspiration, understanding and guidance and who opened new dimensions of experience and scholarship to me.

Approved by:

Vernon P. Helming

Solis L. Kates

Date: May 25, 1960